

LOSS OF CONTROL EATING PREDICTED BY THE INTERACTION BETWEEN
EMOTION REGULATION DIFFICULTIES, DISTRESS TOLERANCE, AND THE
EXPECTANCY THAT EATING REDUCES NEGATIVE AFFECT

by

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A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Science
in the Department of Psychology
in the College of Sciences
at the University of Central Florida
Orlando, Florida

Summer Term
2021

ABSTRACT

A prominent theory of binge eating is the affect regulation theory, which posits that individuals binge eat to alleviate negative affect, and subsequently reduced negative affect reinforces the behavior. Although it is well-supported that individuals experience elevated negative affect pre-binge, findings do not consistently evince reduced negative affect after binge eating. Therefore, the affect regulation theory does not fully account for binge eating. However, habitual binge eating without reliable improvement in affect may be accounted for by expectancy theory.

Expectancies may be predictive of behavior whether the outcomes of a behavior are inconsistent. Additionally, there is an increasing scientific awareness that a sense of loss of control over eating is the most clinically relevant and psychologically distressing component of binge eating and is still associated with adverse outcomes even without objective over-eating. The psychological correlates of low distress tolerance and difficulty regulating one's emotions may contribute to loss-of-control-eating (LOCE), although research to-date primarily focuses on binge eating as a whole. Additionally, expectancy theory has yet to specifically address LOCE. Therefore, it is essential to understand the impact of the expectancy eating will alleviate negative affect (NA reduction expectancy) and psychological factors distress tolerance and emotion regulation difficulties on LOCE. This relationship was assessed with a multiple linear regression model including a three-way interaction between the predictor variables using data from a national online sample of U.S. adults. NA reduction expectancy and emotion regulation difficulties had direct associations with LOCE, but distress tolerance did not. Additionally, when NA reduction expectancy was high, distress tolerance failed to moderate the impact of emotion regulation difficulties on LOCE. However, at low NA reduction expectancy / high distress tolerance,

emotion regulation difficulties no longer significantly contributed to LOCE. Limitations, clinical implications, and directions for future research are discussed.

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CHAPTER 1: INTRODUCTION

According to the *Diagnostic and Statistical Manual of Mental Disorders, 5th edition* (DSM-5), two components of an eating episode characterize a clinical level of binge eating: 1. Eating a definitively larger amount than most people would eat in a discrete time period (e.g., 2 hours) under similar circumstances, and 2. A perception of inability to control one's eating during said period (e.g. feeling one is unable to stop eating, control the amount they are eating, or refrain from onset of eating; American Psychiatric Association, 2013). Binge eating episodes are characteristic of some eating disorders (e.g., Binge Eating Disorder (BED), Bulimia Nervosa (BN); American Psychiatric Association, 2013; Keel et al., 2001a; Kerzhnerman & Lowe, 2002; Latner et al., 2007; Latner & Clyne, 2008; Striegel-Moore et al., 1998). According to the DSM-5, 12-month prevalence of BN among young adult females is 1% - 1.5%. Less is known about the prevalence of BN in males, although the ratio of female-male presentation is approximately 10-1 (American Psychiatric Association, 2013). In contrast, BED rates are more closely matched in both men and women, with the 12-month prevalence suspected to be 1.6% of adult females and 0.8% of adult males in the United States (American Psychiatric Association, 2013). However, evidence increasingly suggests episodes of binge eating may be relatively common in community and sub-clinical samples (Brownstone, 2017; Latner et al., 2007; Mond et al., 2006), as well as university students (Latner et al., 2014; Vannucci et al., 2013). In an online survey of 646 U.S. adults, nearly 30% indicated having engaged in at least 1 eating episode that meets binge eating criteria within the past 3 months ($n = 176$, 27.24%; Brownstone, 2017). In a study of 15,126 Australian adults at 6 timepoints over 18 years, Mitchison and colleagues found that 13% of the population engaged in past 3-month binge eating in 2015. This prevalence was a 6-

fold increase from the first data collection point in 1998, when only 2.7% of the population reported binge eating behavior, suggesting binge eating is becoming increasingly more prevalent (Mitchison et al., 2017). The prevalence of binge eating is alarming, in large part due to its often resulting in greatly impairing health outcomes, including obesity (Isnard et al., 2003; Matos et al., 2002; Zwaan, 2001), cardiac disease (Bankier et al., 2004), and diabetes (Crow et al., 2001; Raevuori et al., 2015). Obesity-related conditions, including cardiac disease, represent three out of the top 10 causes of death world-wide, according to the World Health Organization (World Health Organization, 2020). Additionally, binge eating is often affiliated with numerous debilitating psychological conditions, including depression (see review; Araujo et al., 2010), anxiety (Isnard et al., 2003; Latner et al., 2007; Matos et al., 2002; Rosenbaum & White, 2015), stress (Latner et al., 2007; Rosenbaum & White, 2015), and other forms of maladaptive coping, such as problematic alcohol use (see review; Ferriter & Ray, 2011). Binge eating is also associated with other eating pathology, such as poor body image (Matos et al., 2002; Wardle et al., 2001), weight/shape concern (Latner et al., 2007; Racine & Horvath, 2018) and compensatory behaviors (Latner et al., 2007). While psychological vulnerabilities such as stress (Adam & Epel, 2007), body dissatisfaction, and depression may predispose one to binge eating (Wardle et al., 2001), it has also been found that binge eating may exacerbate or lead to comorbid pathologies such as compensatory behaviors (Haedt-Matt & Keel, 2011) and depressive symptoms (Wegner et al., 2002).

Given the prevalence of binge eating, and its implicated role in numerous mental and physical conditions, it is vital to understand the key psychological phenomena at play. In order to do so, I will first introduce a commonly held theory of binge eating (e.g. the affect regulation

theory), provide a potential explanation of shortcomings of that model with an additional theory (e.g. the expectancy theory), and then apply the scaffolding of the expectancy theory of binge eating to the specific psychological element of loss-of-control eating (LOCE), a psychologically distressing phenomenon with clinical salience both with and without objective over-eating (Latner et al., 2014).

The Affect Regulation Theory of Binge Eating

A prevailing explanation for binge eating is that individuals may binge eat to regulate negative affect. The affect regulation theory of binge eating posits that binge eating is a regulatory tool in response to heightened negative affect and binge eating behavior is reinforced by subsequent reduction in negative affect (Haedt-Matt & Keel, 2011). There are two parts to this theory: 1. Elevated momentary negative affect (i.e. emotional distress) in individuals who use food to regulate emotions leads to binge eating, and 2. binge eating leads to a reduction in negative affect, reinforcing the behavior (Polivy & Herman, 1993). The first part of the affect regulation theory is robustly supported. Findings across from both cross-sectional studies and ecological momentary assessment (EMA) paradigms have found that that momentary negative affect increases prior to binge eating (Alpers & Tuschien-Caffier, 2001; Berg et al., 2013; Haedt-Matt & Keel, 2011; Smyth et al., 2007; Stevenson et al., 2018). In one meta-analytic review of individuals who met criteria for BED or BN, between 69 – 100% of each sample reported negative affect as a trigger for binge eating episodes across cross-sectional studies (Haedt-Matt & Keel, 2011). Haedt-Matt and Keel (2011) also found similar results in their review of EMA research, where negative affect was found to be greater before binge eating compared to average

ratings across timepoints, with a weighted mean effect size of .63 across 17 studies. However, the second part of the affect regulation theory, or the assertion that binge eating leads to a reduction in negative affect, is inconsistently supported (Berg et al., 2013; Crosby et al., 2009; Goldschmidt et al., 2012; Haedt-Matt & Keel, 2011; Selby et al., 2012; Smyth et al., 2007; Stevenson et al., 2018). In the same meta-analysis by Haedt-Matt & Keel (2011), when negative affect was reported to decrease post-binge, only 50 – 66% of BN patients in cross-sectional study reported this outcome, suggesting that improvement in negative affect is inconsistent or not present for approximately half of individuals engaging in binge eating behavior across those studies. What's more, other studies on BN and BED samples concluded that not only does binge eating fail to reduce negative affect for their entire sample, negative affect may increase post-binge eating in 85 – 100% of individuals (Haedt-Matt & Keel, 2011). In addition, Haedt-Matt & Keel noted that across 17 EMA studies, negative affect increased across all studies after binge eating, with an average effect size of .50. It also may be the case that for some, pathological eating does not alter affect at all. A recent EMA paradigm has found that negative affect will remain unchanged, or even increase in the case of guilt, after losing control over one's eating (Stevenson et al., 2019). It is therefore arguable that negative affect is not consistently alleviated either within or across individuals who engage in binge eating behavior. These findings suggest there may be other factors at play in behavioral binge eating reinforcement than reliable negative affect reduction. One possible factor may be the role of expectancies, or that individuals expect eating to alleviate their negative affect.

Expectancy Theory of Binge Eating

Expectancy theory posits that behavior is attributable to *expectations* of the results rather than purely observable outcomes (Jones et al., 2001). Of critical importance to expectancy theory is that expectancies do not have to be accurate to influence behavior and can be learned indirectly (e.g., through modelling by others, observation), as well as directly through personal experiences (Jones et al., 2001). In other words, an outcome expectancy of a behavior may not necessarily be based in consistent historical confirmation. According to the network memory model, expectancies can be conceptualized as being based on learned information based on associations of the effect of the behavior (Dunn & Goldman, 1998, 2000). Expectancy theory has been applied to an array of maladaptive coping behaviors, most notably problematic alcohol consumption (Jones et al., 2001). In alcohol use, expectancies, and particularly positive expectancies, have been found to be associated with greater likelihood of alcohol consumption and precede drinking behavior (Dunn & Goldman, 1998, 2000). Additionally, challenging drinking expectancies significantly reduces alcohol consumption among individuals at high-risk for alcohol dependence (Darkes & Goldman, 1998; Dunn et al., 2000).

Although a less-explored domain than alcohol research, expectancy theory has also been applied to assessing a range of eating pathology. Expectancies relevant to thinness (e.g. “I would feel more capable and confident if I were thin”) are endorsed at significantly higher rates in individuals with anorexia nervosa (AN) and BN than those without those pathologies (Hohlstein et al., 1998), as is drive for thinness (Atlas, 2004). Among university students, the expectation that one has the ability to regulate negative affect self-sufficiently is moderately negatively associated with binge eating behavior (Pratt, 2019) and the expectancy that eating will reduce

stress is predictive of greater binge eating frequency (Henry, 1996). Additionally, the expectancy that eating will help manage negative affect is associated with BN symptoms (Atlas, 2004), which theoretically may map on to the binge eating component of the disorder. In a study probing a semantic memory network of eating expectancies, greater binge eating pathology was found to be associated with greater salience of a positive-negative dimension of expectancies, rather than a satisfied-unsatisfied dimension in a mixed sample of university students and adults seeking weight loss treatment (Gokee-LaRose, 2006). In contrast, individuals in the sample with low binge pathology placed more emphasis on expectancies relevant to the satisfied-unsatisfied dimension (Gokee-LaRose, 2006). When applied to binge eating behavior, findings regarding expectancy theory strongly evince a relationship with the expectancy that eating will reduce negative affect (Hohlstein et al., 1998). Expectancies that eating will improve emotional states (e.g., reduce negative affect and alleviate boredom) are higher in individuals exhibiting binge eating pathology who meet eating disorder criteria (Boerner et al., 2004; Hayaki, 2009; Hohlstein et al., 1998; Schaumberg et al., 2016; Simmons et al., 2002). Samples meeting clinical criteria also have shown that the expectancy that eating will alleviate negative affect (NA reduction expectancy) is associated with greater binge eating frequency (De Young et al., 2014; Fischer & Smith, 2008). In university students, NA reduction expectancy is associated with greater endorsement of binge eating symptoms (Hayaki, 2009), and in a three-year longitudinal study, higher NA reduction expectancy predicted future onset of binge eating symptoms in adolescent girls (Smith et al., 2007). The expectancy that eating will alleviate boredom (boredom alleviation expectancy) has also been found to be elevated in populations exhibiting binge pathology, however less frequently and often to a lesser degree than the NA reduction expectancy,

suggesting this relationship cannot be as robustly concluded (Atlas, 2004; Boerner et al., 2004; Hayaki, 2009; Hohlstein et al., 1998). Similarly, positive eating expectancies (expectancies that eating is pleasurable and useful as a reward or the that eating enhances cognitive ability) do not generally appear to contribute to binge eating pathology, although one study did conclude that pleasure expectancy was positively correlated with binge frequency in women with BN (Bohon et al., 2009). In most studies to-date, the positive/reward expectancy has been found to be either inversely related to binge eating behavior (De Young et al., 2014), or the effect was non-significant (Hayaki & Free, 2016; Hohlstein et al., 1998).

Therefore, for many, the reinforcing mechanism behind binge eating may be NA reduction expectancy, or essentially expecting eating will regulate negative emotions. This expectancy may be present even in the absence of consistent historical confirmation, given that expectancies can be formed and reinforced not only through consistent experience (e.g., a decrease in negative affect after losing control over one's eating) but also from inconsistent historical confirmation and from indirect learning of the expectancy (such as modeling by others, social learning; Jones et al., 2001). These elements, that 1. expectancies can be formed and reinforced even if outcomes are inconsistent or not present, and 2. expectancies can be formed and reinforced through outside influence, may inform why people lose control over their eating in response to elevated negative affect.

The Unique Importance of a Sense of Loss-of-Control Eating

As described previously, the DSM-5 characterizes a binge eating episode through two criteria that must be present: an objectively large amount of food consumed within a set time

period, and a sense of having loss of control over one's eating (American Psychiatric Association, 2013). This definition pertains to an objective binge episode (OBE), which meets full binge eating criteria, as opposed to a subjective binge episode (SBE), which is characterized by a sense of LOCE, but does not meet criteria for a full binge episode based on the amount of food consumed (Brownstone, 2017). In recent years, research focusing on SBEs has resulted in a greater understanding of the importance of LOCE in affective pathology. Community women endorsing either primarily SBEs or OBEs endorsed comparable rates of general eating disorder pathology, anxiety, and depression (Latner et al., 2007). SBEs alone have also been found to be comorbid with other areas of impairment caused by binge eating, including functional impairment (Mond et al., 2006) and higher obesity (Palavras et al., 2013). LOCE in OBEs and SBEs has been linked to many disordered eating behaviors and cognitions (e.g. poor body image, compensatory behaviors, restrictive eating, weight/shape concerns; Brownstone, 2017; Keel et al., 2001b; Kerzhnerman & Lowe, 2002; Latner et al., 2007, 2014; Striegel-Moore et al., 1998), as well as greater stress (Latner et al., 2007; Vannucci et al., 2013), anxiety (Brownstone, 2017; Jenkins et al., 2012; Latner et al., 2007), and depression (Brownstone, 2017; Jenkins et al., 2012; Latner et al., 2007). In university students, LOCE was more significantly associated with poorer quality of life in both OBEs and SBEs, suggesting that LOCE may be a more significant indicator of pathology than the amount of food consumed (Jenkins et al., 2012).

Other studies have found that a sense of LOCE may be more psychologically salient in both general population samples and individuals with clinical eating pathology than the quantity of food eaten (Johnson et al., 2003). Telch and colleagues (1998) found that 82% of obese women with BED use presence of a sense of LOCE to define an eating episode as a binge, rather

than objective intake. Only 43% of participants reported that objective overeating defines bingeing (Telch et al., 1998). The prevalence of LOCE also mandates a need for understanding factors driving this vulnerability. In a community sample of women meeting eating disorder criteria, 58.4% reported at least weekly SBEs, and 41.5% reported at least weekly OBEs (Mond et al., 2010). In another community sample of U.S. adults, 40% of an online MTurk sample reported past three-month LOCE (Brownstone, 2017). One study of university students, 11.8% report engaging in SBEs only, 15.3% OBEs only, and 13.6% reported engaging in both behaviors, meaning 40.7% of university students endorsed at least one form of LOCE (Jenkins et al., 2012). Another study on college women indicated that 46% of participants experienced at least one LOCE episode within the past three months, with 51.2% reporting SBEs only, 15.9% OBEs only, and 32.9% reporting both forms of LOCE (Vannucci et al., 2013). LOCE is also common in adolescents, with 28% of adolescents between the ages of 12 and 18 reporting past-month LOCE (Goossens et al., 2016).

Of additional note is that while the majority of eating disorder research to-date focuses on females (Murray et al., 2018), studies on LOCE that have included male participants have indicated prevalence of LOCE in males and comparable responding to LOCE measures when present across genders (Goldschmidt et al., 2014; Latner et al., 2014; Palavras et al., 2013), but also co-occurrence of the same psychological vulnerabilities such as anxious (Brownstone, 2017) and depressive symptoms (Brownstone, 2017; Palavras et al., 2013), as well as physical comorbidities (e.g., obesity; Palavras et al., 2013). Additionally, males and females appear to experience the same affect trajectories around LOCE (Kukk & Akkermann, 2017; Stevenson et al., 2018). Therefore, LOCE is a prevalent behavior across numerous populations and sexes that

is associated with significant physical and psychological impairment and distress. These findings suggest it is essential to understand the factors that contribute to LOCE in order to counteract this phenomenon.

Contributors to Loss-of-Control Eating

Given that LOCE is the most psychologically salient element of binge eating, it is unsurprising that LOCE has been found to be preceded by negative affect in both OBEs and SBEs (Brownstone, 2017; Kukk & Akkermann, 2017; Leehr et al., 2015; Pearson et al., 2018; Stevenson et al., 2018). In a recent review of literature on obese patients with and without binge eating disorder, negative affect induction in experimental studies led to a sense of LOCE in patients who engaged in binge eating (Leehr et al., 2015). EMA research has further contributed to elucidating the trajectory of negative affect around a LOCE episode. In community adults and university students, significantly increased negative affect has been found to be predictive of binge eating, but not overeating that is not characterized by a sense of loss-of-control (Kukk & Akkermann, 2017). In another EMA study of community and university adults, negative affect trajectory was been found to be the same for SBEs and OBEs, suggesting no differentiation in negative affect based on quantity of food eaten (Stevenson et al., 2018). Although negative affect was increased on days marked by LOCE, there was no difference in decrease trajectory when compared to days participants did not experience LOCE (Stevenson et al., 2018). These findings from Stevenson and colleagues (2018) suggest the same criticisms of the affect regulation model in binge eating are directly applicable to LOCE as an isolated construct. Similarly, in obese adults, both OBEs and SBEs were preceded by and followed by increases in NA (Goldschmidt et

al., 2012) and in a retrospective study, adults who had engaged in past 3-month SBEs reporting on their most recent LOCE reported significant increases in negative affect after LOCE (Brownstone, 2017). Therefore, although individuals may experience LOCE in response to heightened negative affect, evidence suggests that LOCE fails as a mechanism for emotion regulation (Brownstone, 2017; Goldschmidt et al., 2012; Stevenson et al., 2018), mirroring the same criticisms of the affect regulation model as it applies only to objective binge eating.

Emotion Regulation Difficulties

Emotion regulation is defined as one's awareness of and control over their emotions (Gratz & Roemer, 2004), as well as cognitive or behavioral strategies to shape one's behaviors in response to their emotions (Gross, 2002; Tamir, 2011). Emotion regulation difficulties have been tied to a sense of LOCE across multiple populations including university students (Racine & Horvath, 2018), adolescents (Goldschmidt et al., 2017; Goossens et al., 2016), community adults (Kukk & Akkermann, 2017), and clinical eating disorder populations. Women who engage in SBEs and OBEs have greater emotion regulation difficulties than women who over-eat without losing control over their eating or women with no pathological eating (Racine & Horvath, 2018). Additionally, when negative affect is elevated among women, poor emotion regulation increases binge eating pathology but not overeating without loss of control (Kukk & Akkermann, 2017). Furthermore, emotion regulation difficulties may be predictive of future LOCE behavior. Goldschmidt and colleagues (2017) found that emotion regulation difficulties in adolescents at age 17 prospectively predicted age 18 LOCE. In addition, current emotion regulation difficulties at age 18 were associated with present LOCE (Goldschmidt et al., 2017).

Improvement of emotion regulation ability has been linked to reductions in binge eating frequency and pathology. Intervention research on Dialectical Behavioral Therapy (DBT) has shown it to be effective in reducing or eliminating binge eating (Klein et al., 2013; Safer et al., 2001; Safer et al., 2002) and bulimic symptoms (Klein et al., 2013; Safer et al., 2001), and also result in subsequent weight loss (Safer et al., 2002). DBT emphasizes the importance of adaptive emotion regulation (Linehan, 2014) and previous findings confirm that improvement of emotion regulation abilities may effectively reduce binge eating frequency and pathology (Rahmani et al., 2018).

Despite this body of evidence, the relationship between LOCE and emotion regulation difficulties is not fully understood, nor is there a consensus on the temporal role of emotion regulation difficulties in LOCE. In a mixed sample of community adults and undergraduate participants reporting weekly LOCE, self-reported state-level emotion regulation abilities remained stable on days without endorsement of LOCE but decreased *after* engaging in LOCE on days characterized by LOCE over a two-week period, suggesting emotion regulation difficulties may not trigger LOCE, although they are still associated with the phenomenon (Stevenson et al., 2019). Therefore, while the majority of literature to-date suggests greater emotion regulation difficulties likely contribute to onset of LOCE, contradictory evidence validates the need for continued research into the veracity of those claims and contextual factors that may account for mixed findings.

Low Distress Tolerance

Low distress tolerance is a psychological vulnerability that commonly co-occurs with poor emotion regulation ability (Jeffries et al., 2016; Van Eck et al., 2017). Distress tolerance is

one's perceived ability to withstand psychological distress (Simons & Gaher, 2005). Research to-date indicates a robust relationship between poor distress tolerance and eating pathology associated with LOCE, including emotional eating, eating disinhibition (Kozak & Fought, 2011), and bulimic symptoms (Anestis et al., 2007; Corstorphine et al., 2007). Low distress tolerance predicts bulimic symptoms in both undergraduates (Anestis et al., 2007) and adult women who meet criteria for BN (Corstorphine et al., 2007). In university students, low distress tolerance is additionally associated with eating disinhibition in both cross-sectional (Kozak & Fought, 2011) and experimental studies (Madeley, 2009). Although research to-date on distress tolerance and LOCE has primarily examined LOCE indirectly as a component of binge pathology, preliminary evidence suggests the experience of LOCE is correlated with low distress tolerance both within the context of SBE and OBE episodes in bisexual and lesbian women (Bayer, 2014). Therefore, poor ability to tolerate distress has been implicated in uncontrolled eating pathology and difficulties regulating one's emotions.

From an intervention standpoint, DBT also primarily targets improvement of distress tolerance via cognitive and behavioral strategies (Linehan, 2014). DBT for binge eating behavior targets increasing control over eating by increasing distress tolerance and emotion regulation skills in order to increase coping with negative affect to decrease likelihood of binge eating behavior, cravings and food preoccupation, and mindless eating (Klein et al., 2013; Safer et al., 2009; Wiser & Telch, 1999). Another intervention study has found that improvement in distress tolerance is associated with concurrent improvements in emotion regulation and emotional eating (Juarascio et al., 2020). These findings are corroborated by our recent study showing a moderating influence of distress tolerance on the indirect relationship between emotion

regulation difficulties and LOCE, suggesting greater distress tolerance may be protective against LOCE, even in the presence of emotion regulation difficulties (Burr et al., 2020).

Application of Expectancy Theory to Fill the Gaps

Although emotion regulation difficulties and low distress tolerance have been implicated in LOCE, evidence of their contribution has not been thoroughly assessed in the literature to-date. However, limited preliminary research supports the supposition that these vulnerabilities are linked. In our recent research (Burr et al., 2020), a moderating influence of high distress tolerance on the indirect association between emotion regulation difficulties and LOCE was detected, suggesting that higher distress tolerance may be protective against LOCE, as it attenuates the impact of poor emotion regulation ability. However, there is a dearth of findings addressing the interactive effect of emotion regulation difficulties and distress tolerance level on LOCE, evincing a need for further research into factors that may contribute to such an association.

There is even less literature evaluating the role of eating expectancies in LOCE. Although expectancy theory suggests NA reduction expectancy may account in-part for binge eating behavior, research-to-date has largely neglected to assess the effect of eating expectancies on LOCE as an independent construct. Preliminary findings among substance users indicate the NA reduction expectancy predicts bulimic symptoms directly and in an interaction with low distress tolerance (Lavender et al., 2015). Additionally, the NA reduction expectancy is correlated with greater emotion regulation difficulties in university students (Hayaki & Free, 2016; Kauffman et al., 2018) and predictive of greater bulimic symptoms within those populations (Hayaki & Free,

2016). Theoretically, expecting eating to reduce one's negative affect may be particularly salient for individuals with poor emotion regulation ability and low distress tolerance, as they may turn to LOCE as a way to self-regulate.

The primary intent of this study is to evaluate whether there are main effects of emotion regulation difficulties, low distress tolerance, and the NA reduction expectancy on LOCE, as well as to test for an interactive effect between the three variables (see hypotheses below). Although all three of these vulnerabilities have been independently tied to binge eating, they have not been assessed simultaneously to-date in LOCE, and to the author's awareness, the NA reduction expectancy has not been evaluated in LOCE independently of objective overeating at all.

In addition, the main and interactive effects of the boredom alleviation expectancy and the reward/pleasure expectancy by emotion regulation difficulties and distress tolerance are assessed in separate models, as these two expectancies may also have relevance to LOCE behavior. As aforementioned, the boredom alleviation expectancy is conceptualized as another negative reinforcement expectancy (Hohlstain et al., 1998), and has been found to be predictive of binge eating behavior, albeit not to the same degree as the NA reduction expectancy (Atlas, 2004; Boerner et al., 2004; Hayaki, 2009; Hohlstain et al., 1998). The reward/pleasure expectancy is inconsistently related with binge eating behavior, with one study concluding the expectancy to be predictive of binge eating (Bohon et al., 2009), but most research to-date suggesting either a negative association (De Young et al., 2014) or non-significant effect (Gokee-LaRose, 2006; Hayaki & Free, 2016; Hohlstain et al., 1998). Therefore, while not directly related to hypotheses, comparing the effects of these expectancies on LOCE in otherwise

identical models to the NA reduction expectancy aids in identifying whether it is the NA reduction expectancy specifically that may contribute to LOCE, or whether greater expectancies relative to eating generally are predictive of LOCE.

CHAPTER 2: HYPOTHESES

H1. Distress tolerance, emotion regulation difficulties, and the negative affect reduction eating expectancies will all be directly associated with LOCE (see *Figure 1*). Specifically, greater NA reduction expectancy, lower distress tolerance, and greater emotion regulation difficulty ratings are anticipated to all have main effects on LOCE.

H2. There will be a significant three-way interaction between emotion regulation difficulties, distress tolerance, and NA reduction expectancy. Given that the NA reduction expectancy is arguably motivated by the desire to self-regulate negative emotions and prior findings of the attenuating effect of distress tolerance on emotion regulation and LOCE (Burr et al., 2020), the anticipated relationship is that distress tolerance and NA reduction expectancy moderate the effect of emotion regulation difficulties on LOCE (see *Figure 2*). See H2A and H2B for details.

H2A. Among individuals with low distress tolerance and high NA reduction expectancy, emotion regulation difficulties will be a robust predictor of LOCE. H2B. Among individuals with low NA reduction expectancy, there will not be a statistically significant association between difficulties in emotion regulation and LOCE, regardless of distress tolerance level (see *Figure 3*).

CHAPTER 3: METHOD

Participants

Participants are a national sample of U.S. adults, ages 18-65, who completed an online screener for a two-phase study on loss-of-control eating and associated psychological correlates. In a prior study observing the moderating influence of distress tolerance on the indirect relationship between emotion regulation difficulties and LOCE on men and women (Burr et al., 2020), the effect size of the indirect relationship was small, but significant (Cohen's $f^2 = .003$, $p < .001$). Of note, the effect size within this sample was more robust for men than for women, with the interactive effect over twice as strong for males within the sample. However, men only comprised 35% of the sample, so only the total effect size is utilized and comparable. The importance of inclusion of males in eating pathology research is further discussed in Diversity and Inclusion Considerations. In order to have clinical relevance, the interactive effect proposed in these analyses (see *Analyses*) needs to be at least as robust a predictor as these previous findings, requiring a sufficient sample size to detect this effect size. To reach adequate statistical power for the proposed analyses, a sample size of 2619 participants was required. This study was advertised through Facebook to a nation-wide sample. Participants ($N = 3331$) meet the following inclusion criteria: 1. age of 18 years or older, 2. English-speaking, and 3. residency in the United States.

Diversity and Inclusion Considerations

Men have been historically under-represented in eating research, with a recent call to action indicating that less than 1% of research on disordered eating focusing on males, although

disordered eating in males may be increasing significantly (Murray et al., 2018). In addition, males have been found to present at higher rates with pathology relevant to LOCE, with estimates suggesting up to 25% of BED patients are male (Weltzin et al., 2005). There has been a growing recognition of the importance of including men in eating research, however many studies on LOCE to-date did not include males in their samples (Jenkins et al., 2012; Latner et al., 2007; Mond et al., 2006; Vannucci et al., 2013). This omission is an oversight, given that in studies in which males were included, they not only reported presence of LOCE, but also the same associations with negative affect (Kukk & Akkermann, 2017; Stevenson et al., 2018) and psychological vulnerabilities (Brownstone, 2017; Palavras et al., 2013). Additionally, although men may have lower average NA reduction expectancy, the same significant associations have been found for men as for women between the NA reduction expectancy and eating pathology (Boerner et al., 2004). Therefore, failure to include males in LOCE and expectancy research would be a disservice to men and to eating literature at large.

Procedure

After receiving IRB approval, data were collected nationally via an online survey advertised through Facebook and Instagram and hosted on Qualtrics between August 2020 and October 2020. This survey served as the initial phase of a 2-phase study titled “*Mood, Eating, and Related Behaviors During the COVID-19 Epidemic*”. The second phase of the study was a 10-day self-report on eating behavior and daily stressors in 109 randomly selected individuals who self-reported habitual loss-of-control eating. Only the screener data (Phase 1) from the project is utilized for this thesis.

Ethical Considerations

The primary ethical concern within this study was potential breach of confidentiality. All data was collected via Qualtrics' secure web platform through the UCF accounts linked to approved study personnel. Because the overall study was two-part and a sub-sample of the participants assessed here provided their email for follow-up, the REALE-TIME Laboratory's standard operating procedure (SOP) for collecting data for participants with identifiable information was utilized (see *Appendix C*). In brief, each participant first consented to the project on Qualtrics and administered the survey. Then, if they agreed to be considered for the second phase of the study, the participant selected to be redirected to a separate survey, where they entered their email address. This method separated out the PII databases from the participant data. Qualtrics generated a unique ID number for each participant, which was visible in the downloaded data files and used to link the email addresses to responses. Data files were downloaded only to university-provided equipment given to and accessible by IRB-approved study personnel.

An additional ethical consideration for this study is the significant financial impact of the coronavirus pandemic (COVID-19) within the United States during the dates of data collection, which has led to an economic recession (Center on Budget and Policy Priorities, 2021). Given that there was potential financial gain for participation in the study, it is arguable that participants may have felt more motivated to participate in an opportunity to earn money than they otherwise would. This concern was counteracted by compensation for Phase 2 participants via Amazon gift cards rather than cash money and by providing only up to \$25.00 worth of compensation.

Measures

Loss-of-Control over Eating Scale (LOCES)

The LOCES (Latner et al., 2014) is a 24-item self-report measure of one's perceived control over their eating over the past 28 days, based on frequency of LOCE cognitions and behaviors (e.g. "I felt like the craving to eat overpowered me"). Items are a series of Likert scales rated 1 – 5 ("never" to "always"), with higher scores indicating greater loss-of-control eating pathology. The LOCES demonstrates good internal consistency and yields a total score and three subscale scores (behavioral aspects, cognitive/dissociative aspects, positive/euphoric aspects), however, as the subscales are highly correlated with the total score and only 13 of the 24 items map onto a single factor (Latner et al., 2014), the mean total score was utilized for these analyses. The LOCES has been validated across multiple populations and is predictive of eating pathology, as well as SBE and OBE behavior (Stefano et al., 2016). The alpha reliability coefficient for this study is .96.

Eating Expectancies Inventory (EEI)

The EEI (Hohlstein et al., 1998) is a 34-item assessment of expectancies of eating-related outcomes. Items on the EEI each load onto 1 of 5 subscales (e.g., eating helps manage negative affect, eating is pleasurable and useful as a reward, eating leads to feeling out of control, eating enhances cognitive competence, and eating alleviates boredom). Because eating expectancy isn't in and of itself pathological and the intercorrelations of expectancy factors were small – moderate (.00 - .61) in the validation study and not all statistically significant, the EEI only yields subscale scores (Hohlstein et al., 1998). All EEI items are rated on a 1 – 7 Likert scale

based on agreement with each statement (“completely disagree” to “completely agree”). The EEI shows good discriminant and convergent validity (Hohlstein et al., 1998), is invariant across race (Atlas et al., 2002), and has been used to reliably assess expectancies in individuals with binge eating pathology (Boerner et al., 2004; Fischer et al., 2004; Hohlstein et al., 1998). Based on results from previous findings regarding the role of expectancies in binge eating, only three of the EEI expectancies were assessed within this study. Mean total scores were used for each of the subscales.

Expectancy Eating Reduces Negative Affect (EEI-NA)

The EEI-NA consists of 18 items assessing expectancies that negative affect will be reduced via eating (e.g., “When I am feeling depressed or upset, eating can help me take my mind off my problems.”). The alpha reliability coefficient for the EEI-NA in this sample is .93.

Expectancy Eating Alleviates Boredom (EEI-B)

The EEI-B is a 4-item subscale of the EEI where items assess the expectancy that eating reduces boredom (e.g., “When I have nothing to do, eating helps relieve the boredom.”). The alpha reliability coefficient for the EEI-B in this sample is .61.

Expectancy Eating is Pleasurable and Useful as a Reward (EEI-P)

The EEI-P is a 6-item EEI subscale assessing the expectancy that eating is enjoyable or incites pleasure (e.g., “Eating is fun and enjoyable.”). The alpha reliability coefficient for the EEI-P in this sample is .73.

Distress Tolerance Scale (DTS)

The DTS (Simons & Gaher, 2005) is a 14-item assessment of perceived ability to tolerate emotional distress with items rated 1 – 5 (“strongly agree” to “strongly disagree”) based on agreement with statements relating to subjective experience of distress (e.g. “I can’t handle feeling distressed or upset”). 1 item (item 6, “I can tolerate being distressed or upset as well as most people”) is reverse-coded. Higher mean scores indicate greater distress tolerance. The DTS has been shown to have good convergent, discriminant, and criterion validity (Simons & Gaher, 2005), and its psychometric properties have been validated among individuals with eating pathology (Corstorphine et al., 2007). The alpha reliability coefficient for the DTS in this study is .91.

Difficulties in Emotion Regulation Scale (DERS)

Poor emotion regulation was assessed via the DERS (Gratz & Roemer, 2004), a 36-item measure of self-reported difficulties regulating ones’ emotions (e.g. “I experience my emotions as overwhelming and out of control”). The DERS contains six subscales (e.g., lack of emotional awareness, lack of emotional clarity, emotional non-acceptance, impulsivity when distressed, lack of access to functional coping strategies, and difficulty accomplishing goals when distressed) and additionally yields a total score representing global emotion regulation difficulties. Items are rated on a 6-point Likert scale based on frequency (1 = “almost never, 0-10%” to 5 = “almost always, 91-100%”) with higher total scores indicating greater difficulty regulating emotions. 11 items are reverse scored (e.g., “I pay attention to how I feel”). Mean

DERS scores were used for these analyses and the alpha reliability coefficient for this sample is .85.

Eating Disorder Examination Questionnaire (EDEQ)

The EDEQ (Fairburn & Beglin, 2008) measures general eating pathology through a total score that is the mean of the four subscales (dietary restriction, eating concerns, shape concerns, and weight concerns). The EDEQ consists of 28 items rated on Likert scales rated 1-7, with each rating representing increasing frequency of eating pathology cognitions (e.g., “Have you had a definite fear that you might gain weight?”) and behaviors (e.g., “Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight?”) over the past 28 days (“no days” to “every day”). The EDEQ was controlled for in order to tap LOCE as an independent construct within the model, given its high co-occurrence with other eating pathology. Only the mean total score was utilized for these analyses. The alpha reliability coefficient of the EDEQ in this study is .88.

Depression, Anxiety, and Stress Scale-21 Item Version (DASS-21)

Psychological distress was measured via the DASS-21 (Henry & Crawford, 2005), a well-established, 21-item self-report assessment yielding three subscales (depression, anxiety, and stress), and a total score that represents generalized psychological distress. Items on the DASS-21 are statements rated 0-3 (“did not apply to me at all” to “applied to me very much or most of the time”) based on how much the individual considers each distress-related statement to be characteristic of their experiences over the previous week (e.g., “I found it difficult to relax”).

The DASS-21 shows excellent reliability in samples from the adult population, and construct validity suggests high correlation between the subscales, lending support to utilization of the entire measure as one domain (Henry & Crawford, 2005). Mean total scores were utilized in analyses to account for psychological distress. The alpha reliability coefficient of the DASS-21 in this study is .94.

Demographic Variables

Age, biological sex, height (feet) and weight (pounds) were self-reported. Body mass index (BMI) was calculated via the English System formula provided by the Center for Disease Control (CDC): $\text{weight (pounds)} / [\text{height (inches)}]^2 \times 703$ (Centers for Disease Control and Prevention, 2014).

Analyses

Power Analysis

A power analysis was conducted in G*Power 3.1 to determine the required samples size. We assume that any three-way interactions must be at least as robust as the prior two-way interaction of difficulties in emotion regulation x distress tolerance in order to have practical significance. Thus, we assume a small effect size of Cohen's $f^2 = .003$, 1-B = .80, alpha = .05 with 1 predictor of interest and 20 additional covariates. This resulted in a required sample size of 2,619. The dataset has 3,331 observations, allowing for ample power to detect both statistically significant effects.

Data Preparation

This dataset collected observations from $N = 3542$, but 205 participants did not provide any data across survey items and were thus removed. In addition, 6 participants indicated being under 18 years of age, after indicating being aged 18 or older during the consent process. The survey logic was designed to terminate responding after reporting an age of 17 or less, resulting in the survey self-terminating after this item and removal of their data. This resulted in a final analysis sample of $n = 3331$. Multiple imputation was used in STATA SE v.16 to impute missing values for data missing within a measure. Full information maximum likelihood estimation with robust standard errors (MLR) was used in *Mplus* v.8 (Muthén & Muthén, 2020) to handle cases missing entire measures. Parameter estimates in MLR are standard maximum likelihood estimates and standard errors are calculated using observed information for both complete and incomplete data. Thus, data from all observations that provided at least some responses for the study across measures was utilized. The mean score of all continuous measures was calculated and utilized and all continuous measures were mean-centered prior to regression analyses.

Multiple linear regression assumptions were assessed in STATA SE v. 16. A visual inspection of the histogram of the residuals indicated the distribution was slightly leptokurtic (see *Figure 4*), however, multiple linear regression methods are robust to mild kurtosis violations (Cohen et al., 2003). A scatterplot of the residuals also indicated a small to moderate violation of homoskedasticity, although not enough to discredit use of linear regression methods (Cohen et al., 2003). Variance inflation factor (VIF) and tolerances for each of the variables were calculated to assess for multicollinearity. VIF ranged 1.043– 2.42 ($M = 1.57$) and tolerance ranged 0.413 – 0.955, indicating no evidence of multicollinearity as all VIF values were below 10 and all tolerance values were greater than .10 (Cohen et al., 2003). Studentized residuals of

the regression analyses were calculated to assess for potential outliers. Eighteen data points had residuals outside of three standard deviations from the mean, however, the influence of these data points is negligible in a sample size of 3,331 participants, particularly as only three participants were outside of four standard deviations away.

Planned Analyses

Bivariate correlations were run on all variables to assess the zero-order correlations. A multiple linear regression analysis was conducted in *MPlus* v.8 to assess the main effects of emotion regulation difficulties, distress tolerance level, and the NA reduction expectancy, as well as a three-way interactive effect between the three predictor variables, on LOCE. The model also accounted for age, sex, BMI, EDEQ scores, and DASS-21 scores. The hypotheses were specific to the three-way interaction. This interaction was probed at high (+1SD) and low (-1SD) levels of EEI-NA and DTS to examine conditional associations between LOCES and DERS.

Posthoc Analyses

Two additional multiple linear regression analyses were run including two other EEI subscales: the expectancy that eating alleviates boredom (EEI-B), and the expectancy that eating is pleasurable or useful as a reward (EEI-P). The purpose of these additional regressions was to assess whether they contributed to the model and predicting LOCES in a similar way to EEI-NA, given both their significant correlations with LOCES scores, and to assess whether the NA reduction expectancy is a unique contributor to the model or if greater expectancies in general influence LOCE.

Three four-way interactions that included all three-way interaction variables, plus the additional predictor of DASS-21 were also conducted to assess for the potential moderating

impact of levels of general distress. However, none of the four-way interactions were statistically significant contributors to the models. In addition, the sample size of 3331 participants is not sufficiently powered to assess for four-way interactions based on our hypothesized effect ($N = 3984$ would be required).

CHAPTER 4: RESULTS

Descriptive and Bivariate Statistics

The final sample consisted of 3331 participants ($M_{\text{age}} = 35.17$, $SD = 13.43$). In terms of biological sex, 21.52% ($n = 717$) of the sample identified as male and 78.48% ($n = 2614$) identified as female. Regarding racial identity, the sample was predominantly White (70.1%, $n = 2339$), followed by Black/African American (13.6%, $n = 452$), Asian (11.1%, $n = 370$), American Indian or Alaskan Native (5.9%, $n = 198$), Native American or Hawaiian (0.5%, $n = 17$), and Other (3.0%, $n = 99$). In terms of ethnicity, 9.8% of the sample identified as Hispanic/Latino ($n = 325$). With the exception of the underrepresentation of Hispanic/Latino individuals, this sample closely mirrors the racial and ethnic breakdown of the 2019 U.S. census (United States Census Bureau, 2019).

LOCES scores were significantly positively correlated with DERS ($r = .505$, $p < .001$), EEI-NA ($r = .676$, $p < .001$), and EEI-B ($r = .303$, $p < .001$), and significantly negatively correlated with DTS ($r = -.323$, $p < .001$) and EEI-P ($r = -.093$, $p < .001$). See *Table 1* for additional descriptive statistics and bivariate correlations.

Regression Analyses

Negative Affect Reduction Expectancy

A multiple linear regression analysis with 4 steps was conducted on the data (see *Table 2*). The first step of the analysis consisted of all of the participant characteristic variables: age ($b = 0.003$, $SE = 0.001$, $\beta = .050$, $p < .001$), sex ($b = 0.165$, $SE = 0.024$, $\beta = .074$, $p < .001$), BMI ($b = -0.005$, $SE = 0.001$, $\beta = -.041$, $p = .002$), and EDEQ scores ($b = 0.303$, $SE = 0.012$, $\beta = .421$, p

< .001), and accounted for 49.0% of variance in LOCES scores, with EDEQ serving as a particularly strong contributor ($z = 26.07$). Step 2 of the model additionally included the main effects of DASS-21, DERS, DTS, and EEI-NA. Step 2 significantly accounted for an increased 19.4% of variance within the model ($R^2 = .684$). DASS-21 ($b = 0.099$, $SE = 0.029$, $\beta = .070$, $p < .001$), DERS ($b = 0.204$, $SE = 0.024$, $\beta = .159$, $p < .001$), and EEI-NA ($b = 0.314$, $SE = 0.011$, $\beta = .449$, $p < .001$) were all positively associated with outcome LOCES within the model, with EEI-NA a particularly strong predictor ($z = 28.174$). Contrary to Hypothesis 1, the main effect of DTS did not reach statistical significance, however there were robust main effects of DERS and EEI-NA, partially supporting Hypothesis 1. Step 3 included all of the two-way interactions for the three model predictors, DERS \times DTS ($b = -0.021$, $SE = 0.014$, $\beta = -.022$, $p = .131$), DERS \times EEI-NA ($b = .065$, $SE = .012$, $\beta = .074$, $p < .001$), and DTS \times EEI-NA ($b = 0.019$, $SE = 0.009$, $\beta = .037$, $p = .032$). All two-way interactions were statistically significant and accounted for an increased 0.4% variance in outcome LOCES ($R^2 = .688$). Step 4 included the hypothesized three-way interaction of DERS \times DTS \times EEI-NA. Supporting Hypothesis 2, the three-way interaction was statistically significant ($b = 0.019$, $SE = 0.009$, $\beta = .036$, $p = .033$), and significantly contributed an additional 0.1% variance to the model ($R^2 = .689$).

In order to probe the three-way interaction, simple slopes were plotted to visualize the interactive effect of DTS on the relationship between DERS and LOCES at low (-1 SD), mean, and high ($+1$ SD) levels of DTS and low (-1 SD), mean, and high ($+1$ SD) levels of EEI-NA. The analysis is stratified by EEI-NA.

Mean EEI-NA

At mean EEI-NA, the interaction between DTS \times DERS was not statistically significant at any level of DTS ($b = -0.021$, $SE = 0.014$, $\beta = -.022$, $p = .131$), indicating that the relationship between DERS and LOCES doesn't vary by DTS at average levels of NA reduction expectancy. As aforementioned, the main effect of DERS was statistically significant ($b = 0.204$, $SE = 0.024$, $\beta = .060$, $p < .001$). This effect is visualized in *Figure 5*.

High EEI-NA

The interaction of DERS \times DTS was also not statistically significant at any level of DTS at high EEI-NA ($b = 0.003$, $SE = 0.020$, $\beta = .003$, $p = .881$). Therefore, the relationship between DERS and LOCES does not vary by DTS at high levels of NA reduction expectancy, contrary to Hypothesis 2A. However, the main effect of DERS within the model remained statistically significant at high EEI-NA and was greater at high EEI-NA than mean EEI-NA ($b = 0.290$, $SE = 0.030$, $\beta = .226$, $p < .001$). This effect is visualized in *Figure 6*.

Low EEI-NA

Partially supporting Hypothesis 2B, DTS had an attenuating effect on the relationship between DERS and LOCES at low EEI-NA ($b = -0.046$, $SE = 0.016$, $\beta = -.048$, $p = .004$). Although the main effect of DERS was still statistically significant, it was attenuated in the model at low EEI-NA / low DTS ($b = 0.176$, $SE = 0.035$, $\beta = .137$, $p < .001$) compared to mean or high EEI-NA. Therefore, at low EEI-NA, there is a significant attenuating effect of DTS in the interaction with DERS, and a significant decrease in the main effect of DERS on outcome LOCES. The main effect of DERS was further attenuated as DTS increased. Although still statistically significant, the main effect of DERS was weaker at low EEI-NA / mean DTS ($b =$

.118, $SE = 0.027$, $\beta = .092$, $p < .001$) and at high DTS, the main effect of DERS was no longer statistically significant ($b = 0.60$, $SE = 0.032$, $\beta = .047$, $p = .061$).

Therefore, DERS has a consistent effect on LOCES when expectancies are at mean or high levels and DTS does not impact that relationship at those levels. However, when EEI-NA is low, DTS has a moderating effect on DERS, such that increased DTS attenuates the relationship between DERS and LOCES. This effect is visualized in *Figure 7*.

Posthoc Analyses Examining Boredom Alleviation Expectancy and Pleasure Expectancy

A second multiple linear regression with 4 steps was conducted on the data, accounting for the effect of EEI-B in place of EEI-NA (see *Table 3*). The first step included participant characteristic variables: age ($b = 0.04$, $SE = 0.001$, $\beta = .060$, $p < .001$), sex ($b = 0.235$, $SE = 0.027$, $\beta = .106$, $p < .001$), BMI ($b = -.004$, $SE = 0.002$, $\beta = -.034$, $p = .029$), and EDEQ scores ($b = 0.377$, $SE = 0.013$, $\beta = .524$, $p < .001$). Step 1 accounted for 49.0% of variance in LOCES scores, with EDEQ once again a strong predictor. Step 2 of the model added the main effects of DASS-21, DERS, DTS, and EEI-B, and accounted for increased 9.0% of variance within the model ($R^2 = .580$). DASS-21 ($b = 0.120$, $SE = 0.034$, $\beta = .085$, $p < .001$), DERS ($b = 0.283$, $SE = 0.028$, $\beta = .221$, $p < .001$), and EEI-B ($b = 0.127$, $SE = 0.012$, $\beta = .175$, $p < .001$) were all positively associated with outcome LOCES within the model, but the main effect of DTS did not reach statistical significance. Step 3 included all of the 2-way interactions for the three model predictors, none of which were statistically significant within the model. Step 4 included the three-way interaction of DERS by DTS by EEI-B, which was also not statistically significant.

A final multiple linear regression analysis was conducted. This analysis had identical structure to the previous two, with the exception being that used the EEI-P expectancy rather

than EEI-NA or EEI-B (see *Table 4*). Step 1 accounted for 49.0% of variance in LOCES scores, with age ($b = 0.003$, $SE = 0.001$, $\beta = .047$, $p = .002$), sex ($b = 0.242$, $SE = 0.028$, $\beta = .109$, $p < .001$), and EDEQ ($b = 0.404$, $SE = 0.013$, $\beta = .561$, $p < .001$) being statistically significant contributors to the model. Step 2 accounted for the main effects of DASS-21, DERS, DTS, and EEI-P and significantly accounted for an increased 6.4% of variance within the model ($R^2 = .554$). DASS-21 ($b = 0.109$, $SE = 0.034$, $\beta = .077$, $p = .002$), DTS ($b = -0.029$, $SE = 0.012$, $\beta = -.040$, $p = .018$), and DERS ($b = 0.279$, $SE = 0.029$, $\beta = .217$, $p < .001$) were positively associated with outcome LOCES within the model, but the main effects of EEI-P did not reach statistical significance. Step 3 included all of the 2-way interactions for the three model predictors, which accounted for an additional .1% of variance in outcome LOCES ($R^2 = .555$). None of the 2-way interactions were statistically significant. The final step of the model was the three-way interaction of DERS by DTS by EEI-P, which approached, but did not achieve, statistical significance ($b = -0.025$, $SE = 0.013$, $\beta = -.037$, $p = .054$).

Posthoc Analyses Examining a Four-Way Interaction in the Regression Models

Three linear regression models incorporating a four-way interaction between DERS, DTS, each expectancy variable (EEI-NA, EEI-B, and EEI-P), and DASS-21 were conducted posthoc to assess whether DASS-21 scores, which assesses general psychological distress, significantly moderates the three-way interactions, given its statistically significant main effect in the three models and the role of negative affect in onset of LOCE behavior. These analyses are purely exploratory, as there was limited statistical power to assess for four-way interactions.

EEI-NA

The four-way interaction for DERS by DTS by EEI-NA by DASS-21 did not achieve statistical significance ($b = 0.018$, $SE = 0.013$, $\beta = .032$, $p = .159$), meaning a relationship between the four-way interaction and LOCES was not identified. However, the main effect of DASS-21 did remain significant within the four-way interaction model ($b = 0.113$, $SE = 0.030$, $\beta = .080$, $p < .001$).

EEI-B

The four-way interaction for DERS by DTS by EEI-B by DASS-21 was also not statistically significant ($b = -0.012$, $SE = 0.014$, $\beta = -.019$, $p = .409$), indicating that it does not contribute to predicting outcome LOCES, although the main effect of DASS-21 remained statistically significant ($b = 0.132$, $SE = 0.034$, $\beta = .094$, $p < .001$).

EEI-P

As with the previous two four-way interactions, the interaction of DERS by DTS by EEI-P by DASS-21 was not statistically significant ($b = -0.028$, $SE = 0.018$, $\beta = -.037$, $p = .134$), although DASS-21 did retain a significant main effect ($b = 0.125$, $SE = 0.036$, $\beta = .089$, $p < .001$).

CHAPTER 5: DISCUSSION

This is the first study to-date to assess the relationship between eating expectancies and LOCE as its own construct outside other eating pathology, as well as the impact of expectancies on the psychological vulnerabilities of emotion regulation difficulties and low distress tolerance. Hypotheses focused on the NA reduction expectancy, although the boredom alleviation expectancy and pleasure expectancy were both also assessed in separate regression models to compare the effect of other expectancies on LOCE within otherwise identical models. It was hypothesized that 1. higher emotion regulation difficulties, lower distress tolerance, and higher NA reduction expectancy would be associated with an increase in LOCE and 2. there would be a 3-way interaction between the three predictors, such that 2A. emotion regulation difficulties would be more strongly associated with LOCE when distress tolerance is low and NA reduction expectancy is high, and 2B. the relationship between emotion regulation difficulties and LOCE would no longer be statistically significant among individuals with low distress tolerance in the presence of low NA reduction expectancy.

The first hypothesis was supported in part. NA reduction expectancy and emotion regulation difficulties were significant positive predictors within the multiple regression model of LOCE, and the NA reduction expectancy had a particularly large influence within the model. It is also noteworthy that the step accounting for the effects of psychological distress, emotion regulation difficulties, distress tolerance, and the NA reduction expectancy accounted for an additional 19.4% of variance within the model accounting for control predictors only, which is a large effect. However, the main effect of distress tolerance was non-significant. This finding was unexpected, given that prior research on distress tolerance and binge eating suggests that lower

distress tolerance is implicated in binge pathology (Anestis et al., 2007; Corstorphine et al., 2007), and the one published study directly linking distress tolerance and LOCE to-date mirrors those findings (Bayer, 2014). Additionally, a prior study on U.S. adults identified a link between distress tolerance and LOCE, but this was mediated by affective lability (Burr et al., 2020). In that same study, distress tolerance also moderated an indirect relationship between emotion regulation difficulties and LOCE by way of affective lability (Burr et al., 2020). Therefore, it may be the case that distress tolerance is a mechanism that influences other psychological factors that are more directly linked to LOCE. However, findings to-date are too limited and mixed to confidently draw this conclusion.

Hypothesis 2 was also supported in-part: the three-way interaction between DERS, DTS, and EEI-NA was statistically significant and accounted for a 4% increase in predicting variance of outcome LOCE. The moderating effect of distress tolerance on the relationship between emotion regulation difficulties and LOCE is seen at low NA reduction expectancy, where higher distress tolerance attenuates this relationship. However, at mean and high levels of NA reduction expectancy, there was no significant interaction between emotion regulation difficulties and distress tolerance. Therefore, Hypothesis 2A was not supported, as the interaction between emotion regulation difficulties and distress tolerance was non-significant at high NA reduction expectancy. Hypothesis 2B was partially supported. Although the interaction between emotion regulation difficulties and distress tolerance was significant at low NA reduction expectancy and the main effect of emotion regulation difficulties was attenuated, the relationship between emotion regulation difficulties and LOCE was still statistically significant at low distress tolerance. However, it is noteworthy that emotion regulation difficulties were increasingly

attenuated across the range of distress tolerance, and no longer statistically significant at high (+1SD) distress tolerance, further evincing not only was there a suppressing effect within the interaction, but that greater distress tolerance at low NA reduction expectancy is protective against LOCE by reducing the effect of emotion regulation difficulties. Therefore, as NA reduction expectancy decreased, not only did mean LOCE decrease (see *Figures 2, 3, and 4*), but ability to tolerate distress also became salient in its ability to attenuate the relationship between difficulties regulating one's emotions and LOCE. Although there is very little published to-date of the interactive roles of these variables on eating, these findings build upon the limited research available. Prior intervention research has found that increasing distress tolerance is associated with increased emotion regulation ability and decreased emotional eating (Juarascio et al., 2020) and a previous cross-sectional study has found that distress tolerance moderates an indirect relationship between emotion regulation difficulties and LOCE (Burr et al., 2020). Present findings expound upon prior research with additional nuance. While it is confirmed in this study that distress tolerance has a moderating influence on emotion regulation difficulties, this influence was only significant under specific conditions, i.e., low NA reduction expectancy. Therefore, the NA reduction expectancy is a very strong predictor of LOCE, and its influence at higher levels may eclipse that of other contributors to LOCE occurrence.

Posthoc regressions were conducted on other eating expectancies. The boredom alleviation expectancy showed a significant positive association predicting LOCE in the second model and the second step in the model including the boredom alleviation expectancy accounted for an additional 11% of variance in outcome LOCE. Although this is a significant effect, including NA reduction expectancy rather than the boredom alleviation expectancy accounted

for 8.4% more variance, and therefore attributes a greater effect. Additionally, there was no significant interactive effect between the expectancy, distress tolerance, and emotion regulation difficulties. The pleasure expectancy also did not show an interactive effect with the other two predictors (although the negative association approached significance), nor was there a significant main effect of the pleasure expectancy on LOCE. Therefore, the NA reduction expectancy is the only expectancy that evinced both main effects on LOCE and three-way interactions with distress tolerance and emotion regulation difficulties in predicting LOCE. The null findings regarding the pleasure expectancy corroborate some prior research regarding the effect of a pleasure expectancy on dysregulated eating (Hayaki & Free, 2016; Hohlstein et al., 1998). However, as aforementioned, most prior expectancy research has been conducted in the domain of alcohol use, where positive or reward expectancies are strongly predictive of problematic drinking (Walters, 1998). Theoretically, it is plausible that the nature of food consumption is not thought to lead to a strong increase in positive mood and state changes (e.g., a “high”) but by its nature, is generally expected to reduce negative affect and therefore may be more likely to be maladaptively utilized when one experiences heightened negative emotions than when one is in a more neutral or positive state. However, this is simply theorizing based on prior research and more targeted research is necessary to empirically differentiate the reason for differences in expectancies between two common maladaptive phenomena.

Multiple linear regression models incorporating four-way interactions accounting for the interactive effect of emotion regulation difficulties, distress tolerance, eating expectancies, and psychological distress were also conducted to assess a potential moderating influence of general psychological distress. These analyses were conducted as psychological distress was a significant

predictor in each of the three-way interaction models, and the robust predictive effect of negative affect on LOCE in prior literature (Brownstone, 2017; Kuk & Akkermann, 2017; Leehr et al., 2015; Pearson et al., 2018; Stevenson et al., 2018). However, none of the models incorporating the effect of general psychological distress in a four-way interaction were statistically significant, although they were not sufficiently powered to do so with a sample size of 3331 participants.

Therefore, hypotheses were partially supported, with findings providing the groundwork for elucidating interactive effects of emotion regulation difficulties, distress tolerance, and eating expectancies in predicting LOCE. The NA reduction expectancy in particular was a strong contributor to LOCE and the stage accounting for this variable and psychological vulnerabilities contributed nearly 20% of explained variance in LOCE to the model. Given that it is robustly evinced that momentary negative affect increases prior to LOCE (Brownstone, 2017; Goldschmidt et al., 2012; Kuk & Akkermann, 2017; Stevenson et al., 2018), it follows that the expectancy that eating reduces negative affect would be strongly associated with greater LOCE. Additionally, previous findings have implicated distress intolerance (Anestis et al., 2007; Bayer, 2014; Corstorphine et al., 2007; Kozak & Fought, 2011) and emotion regulation difficulties (Goldschmidt et al., 2017; Goossens et al., 2016; Kuk & Akkermann, 2017; Racine & Horvath, 2018) in LOCE behavior, as well as an interactive effect suggesting greater distress tolerance may be protective against LOCE, even when emotion regulation difficulties are elevated (Burr et al., 2020). However, this is the first study to evaluate the influence of eating expectancies on LOCE outside of the context of binge eating, as well as an interactive effect of eating expectancies, emotion regulation difficulties, and distress tolerance. Therefore, while findings are promising in regard to identifying NA reduction expectancy as a vulnerability that influences

LOCE both independently and in conjunction with other vulnerabilities, follow-up research is necessary to elucidate and confirm the nature of this relationship. In addition, interventions to increase distress tolerance may be a particularly effective in individuals for which LOCE is an attempt to regulate negative affect when NA reduction expectancy is low.

Limitations

This study had a few limitations. The first is the cross-sectional design, which limits conclusions about the temporal associations between variables. This limitation is particularly applicable as the increased negative affect prior to LOCE is hypothesized to be why individuals with high NA reduction expectancy may be more likely to engage in LOCE, particularly when there is concurrent poor ability to self-regulate one's emotions. Another design limitation is lack of attention check to assess for attentiveness of participants and guard against random responding or bots, which has been found to improve data quality (Shamon & Berning, 2020), although there are methods in which such items can be automatically answered (Pei et al., 2020). Another limitation related to measurement is that the Cronbach's alpha coefficient for the boredom alleviation expectancy is slightly below acceptable (George & Mallery, 2003). The EEI was selected as it is a commonly used measure to assess eating expectancies in binge eating populations (Boerner et al., 2004; Fischer et al., 2013; Hohlstein et al., 1998) and has been shown in prior research to have sufficient validity and reliability (Hohlstein et al., 1998). The EEI has also been shown to be invariant across race (Atlas et al., 2002) and to have the same factor structure across both men and women (Boerner et al., 2004). However, the reliability of EEI-B in particular was questionable in this sample. On a qualitative note, many items in the EEI

are reverse-coded, which could be a potential source of confusion for participants (e.g., “I don’t see eating as a pleasurable event”). It is therefore conceivable that use of another eating expectancy measure would yield response differences, although to the author’s knowledge, there are no other validated comprehensive surveys regarding eating expectancies to-date.

Additionally, this data was collected during the COVID-19 pandemic, which has been marked by a significant increase in daily stressors unique to the epidemic, including financial concerns, concerns about contagion, and changes in social and daily routines (Park et al., 2020). These stressors have had a psychological impact on both the general population and those with a history of LOCE pathology, although it is possible individuals may have attenuated to the distress by August 2020, when data collection began. The psychological distress in a longitudinal national sample of U.S. adults increased significantly between March and April 2020, however, distress returned to baseline levels by June 2020 (Daly & Robinson, 2021). Another study found no significant difference in prevalence of serious psychological distress in adults from the U.S. population between February 2019 and May 2020, however, those who had reported elevated distress at T1 had more significant psychological distress at T2 (Breslau et al., 2021). In patients with a history of BED, binge eating frequency, general eating disorder pathology, and depressive symptoms increased significantly after the onset of the pandemic (Giel et al., 2021). Therefore, the unique conditions of the COVID-19 pandemic may exacerbate distress and pathology, particularly in individuals with psychological vulnerabilities relevant to LOCE.

Clinical Implications

Despite these limitations, these findings provide a springboard for a promising direction in future intervention research. Although there are eating interventions targeting emotion regulation difficulties and low distress tolerance, these interventions are time-consuming and occur over the course of many weeks (Telch et al., 2001), whereas outcome expectancies may be malleable in as little as one intervention session, at least for alcohol use (Lau-Barraco & Dunn, 2008). To-date, the NA reduction expectancy has not been targeted in intervention research, however, related findings suggest that expectancies may be an effective target to reduce LOCE. In one study, food cue exposure resulted in lower endorsement of “if conditioned stimulus, then unconditioned stimulus” expectancies (e.g., “If I have tasty food in front of me, then I cannot resist to eat it”), as well as lower desire to eat in overweight women compared to a control condition (Schyns et al., 2016). However, results regarding food consumption were mixed: while overweight women in the exposure group consumed significantly less of the exposed food item than the non-exposure group, total caloric intake was not significantly different between conditions (Schyns et al., 2016). These findings suggest that while expectancies regarding ability to control one’s eating are malleable; exposure interventions may be too narrow to have practical efficacy in reducing overall food intake. Therefore, while it is noteworthy that expectancies around eating behavior may be influenced in as little as one session, follow up research is still necessary to identify preventing LOCE on a more global level, rather than only specific food cues.

Another expectancy intervention lends more promise to the potential effects of targeting expectancies eating reduces negative feelings. Tice and colleagues (2001) ran undergraduates

through an experiment where they induced either happiness or distress by having participants read and visualize mood-inducing scenarios. Participants were then asked to taste test and rate three types of snack food (pretzels, cookies, and crackers), with some randomly assigned to a “mood freezing” condition, in which they were told they would be given a pill that makes it so that food does not alter their mood. Participants who were in the distress condition and not told that food would be unable to improve their mood consumed larger amounts of food, but when informed that one’s mood was “frozen” such that food could not alter it, distressed participants ate less food. In addition, post-eating mood ratings did not indicate an improvement in affect from eating in any group (Tice et al., 2001). These findings imply individuals may have an expectancy that eating regulates negative affect, given that distressed participants who were not given the placebo consumed significantly greater amounts of food, although it should be noted that affect was not actually improved by eating in any groups. By providing an alternative expectancy, that eating will not change affect (i.e., improve distress), participants consumed less food, theoretically because they did not perceive eating as a way to attenuate negative affect. These findings, in conjunction with prior research linking the NA reduction expectancy to binge eating (De Young et al., 2014; Fischer & Smith, 2008; Hayaki, 2009; Smith et al., 2007) validate the conjecture eating can be motivated by a desire to alleviate negative affect. Present findings extend this work by linking the NA reduction expectancy to the construct of LOCE specifically. Future intervention research is needed to assess whether targeting the NA reduction expectancy reduces LOCE specifically, and if decreases in LOCE hold over time.

Present findings also suggest that attenuation of the NA reduction expectancy allows for greater influence of ability to tolerate distress on emotion regulation difficulties, as the distress

tolerance by emotion regulation difficulties interaction was only statistically significant at low NA reduction expectancy. Therefore, interventions that reduce the NA reduction expectancy may theoretically increase the efficacy of existing treatments meant to bolster distress tolerance, which has a more protective effect against LOCE when there is less expectancy that eating reduces negative affect. Follow up intervention studies should also be conducted to assess whether expectancy interventions increase the efficacy of treatment for LOCE in conjunction with existing treatments.

Summary and Conclusions

The current study examined the role of the NA reduction expectancy in predicting LOCE, both in terms of the direct impact and its influence on the relationship between emotion regulation difficulties and ability to tolerate distress. There are two primary take home messages from this research. First, the NA reduction expectancy strongly predicted LOCE, both in terms of the main effect and in an interactive effect with emotion regulation difficulties and distress tolerance. As the NA reduction expectancy increases, so does LOCE. Second, the role of other focal predictors (and their interactions) seems to only matter when EEI-NA is low, suggesting that greater NA reduction expectancy garners an increasingly higher influence on LOCE, as well as eclipsing other psychological vulnerabilities that are predictive of LOCE behavior. There are two important directions for future research. Follow-up EMA studies should confirm the NA reduction expectancy is present in LOCE, even when affect does not improve post-LOCE. This would elucidate whether the expectancy is salient for individuals who engage in LOCE naturalistically, even when it fails to consistently alleviate negative affect. In addition, EMA

research assessing the temporal levels of state emotion regulation difficulties, state distress tolerance, and state expectancies around LOCE episodes should be conducted in order to confirm the hypothesized direction of these associations. Second, as aforementioned, intervention research should be conducted to assess whether attenuating the NA reduction expectancy in individuals who have high expectations that food will alleviate negative feelings reduces LOCE, and whether changes in eating behavior hold over time. In addition, expectancy interventions should also be tested in conjunction with existing treatments targeting low distress tolerance and emotion regulation difficulties, as these vulnerabilities appear to be more accessible when the NA reduction expectancy is low. Altogether, these findings provide a promising springboard for future research regarding the role of expectancies in LOCE and potential clinical efficacy of targeting the NA reduction expectancy in LOCE treatment.

APPENDIX A: TABLES AND FIGURES

Table 1: Descriptive statistics and bivariate correlations

	Descriptive Statistics			Bivariate Correlations									
	%	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Demographic Variables													
1. Age	--	35.191	13.429	--		.							
2. Sex (female = 0)	78.47	--	--	-.016	--								
3. BMI	--	26.950	8.374	.248**	-.146**	--							
General Eating Pathology													
4. EDEQ	--	2.514	1.270	-.026	.002	.096**	--						
General Psychological Distress													
5. DASS-21	--	24.382	12.637	-.169**	.029	-.069*	.437**	--					
Model Predictors													
6. DERS	--	91.551	26.130	-.243**	-.132**	-.132**	.390**	.711**	--				
7. DTS	--	3.011	0.840	.152**	-.018	.099**	-.266**	-.452**	-.515**	--			
8. EEI-NA	--	70.025	23.517	-.093**	.088**	.014	.439**	.322**	.342**	-.286**	--		
9. EEI-B	--	17.047	5.010	-.090**	-.010	.065*	.214**	.086**	.072*	-.127**	.542**	--	
10. EEI-P	--	28.900	6.982	-.034	-.119**	.143**	-.092**	-.158**	-.252**	.093**	.231**	.427**	--
Outcome Variable													
11. LOCES	--	2.426	0.907	-.048	.134**	-.017	.685**	.490**	.505**	-.323**	.676**	.303**	-.093**

Note: BMI = Body Mass Index; EDEQ = Eating Disorder Examination Questionnaire; DASS-21 = Depression, Anxiety, and Stress Inventory-21 item version; DERS = Difficulties in Emotion Regulation Scale; DTS = Distress Tolerance Scale; EEI-NA = Eating Expectancy Inventory- Expectancy Eating Reduces Negative Affect, * $p < .05$; ** $p < .001$

Table 2: Loss-of-control eating regressed onto a three-way interaction between emotion regulation difficulties, distress tolerance, and the negative affect reduction expectancy

<i>Step</i>	<i>Predictor</i>	<i>b</i>	<i>SE</i>	<i>z</i>	<i>R²</i>	<i>R² change</i>	<i>p</i>
1					.490		<.001
	Age**	0.003	0.001	4.090			
	Sex**	0.165	0.024	6.967			
	BMI*	-0.005	0.001	-3.055			
	EDEQ**	0.303	0.012	26.065			
2					.684	.194	<.001
	DASS-21*	0.099	0.029	3.448			
	DERS**	0.204	0.024	8.362			
	DTS	0.002	0.010	.223			
	EEI-NA**	0.314	0.011	28.174			
3					.688	.004	<.001
	DERSxDTS	-0.021	0.014	-1.511			
	DTSxEEI-NA*	0.019	0.009	2.150			
	DERSxEEI-NA**	0.065	0.012	5.255			
4					.689	.001	<.001
	DERSxDTSxEEI-NA*	0.019	0.009	2.132			

Note: Each model step retains predictors from previous model step and parameter estimates are represent Step 5.

BMI = Body Mass Index; EDEQ = Eating Disorder Examination Questionnaire; DASS-21 = Depression, Anxiety, and Stress Inventory-21 item version; DERS = Difficulties in Emotion Regulation Scale; DTS = Distress Tolerance Scale; EEI-NA = Eating Expectancy Inventory-Expectancy Eating Reduces Negative Affect

* $p < .05$; ** $p < .001$

Table 3: Loss-of-control eating regressed onto a three-way interaction between emotion regulation difficulties, distress tolerance, and the boredom alleviation expectancy

<i>Step</i>	<i>Predictor</i>	<i>b</i>	<i>SE</i>	<i>z</i>	<i>R²</i>	<i>R² change</i>	<i>p</i>
1					.490		<.001
	Age**	0.004	0.001	4.198			
	Sex**	0.235	0.027	8.701			
	BMI*	-0.004	0.002	-2.186			
	EDEQ**	0.377	0.013	30.027			
2					.580	.090	<.001
	DASS-21**	0.120	0.034	3.568			
	DERS**	0.283	0.028	10.116			
	DTS	-0.011	0.011	-0.993			
	EEI-B**	0.127	0.012	10.549			
3					.580	.000	<.001
	DERSxDTS	0.000	0.015	.025			
	DTSxEEI-B	-0.013	0.010	-1.301			
	DERSxEEI-B	-0.021	0.016	-1.286			
4					.580	.000	<.001
	DERSxDTSxEEI-B	0.004	0.010	.407			

Note: Each model step retains predictors from previous model step and parameter estimates are represent Step 5.

BMI = Body Mass Index; EDEQ = Eating Disorder Examination Questionnaire; DASS-21 = Depression, Anxiety, and Stress Inventory-21 item version; DERS = Difficulties in Emotion Regulation Scale; DTS = Distress Tolerance Scale; EEI-B = Eating Expectancy Inventory-Expectancy Eating Alleviates Boredom

* $p < .05$; ** $p < .001$

Table 4: Loss-of-control eating regressed onto a three-way interaction between emotion regulation difficulties, distress tolerance, and the pleasure expectancy

<i>Step</i>	<i>Predictor</i>	<i>b</i>	<i>SE</i>	<i>z</i>	<i>R²</i>	<i>R² change</i>	<i>p</i>
1					.490		<.001
	Age*	0.003	.001	3.146			
	Sex**	0.242	.028	8.754			
	BMI	-0.003	.002	-1.692			
	EDEQ**	0.404	.013	31.763			
2					.554	.064	<.001
	DASS-21*	0.109	.034	3.142			
	DERS**	0.279	.029	9.625			
	DTS*	-0.029	.012	-2.373			
	EEI-P	0.024	.014	1.698			
3					.555	.001	<.001
	DERSxDTS	0.010	.015	0.673			
	DTSxEEI-P	-0.012	.011	-1.089			
	DERSxEEI-P	-0.029	.020	-1.463			
4					.556	.001	<.001
	DERSxDTSxEEI-P	-0.025	.013	-1.930			

Note: Each model step retains predictors from previous model step and parameter estimates are represent Step 5.

BMI = Body Mass Index; EDEQ = Eating Disorder Examination Questionnaire; DASS-21 = Depression, Anxiety, and Stress Inventory-21 item version; DERS = Difficulties in Emotion Regulation Scale; DTS = Distress Tolerance Scale; EEI-P = Eating Expectancy Inventory-Expectancy Eating is Pleasurable and Useful as a Reward

* $p < .05$; ** $p < .001$

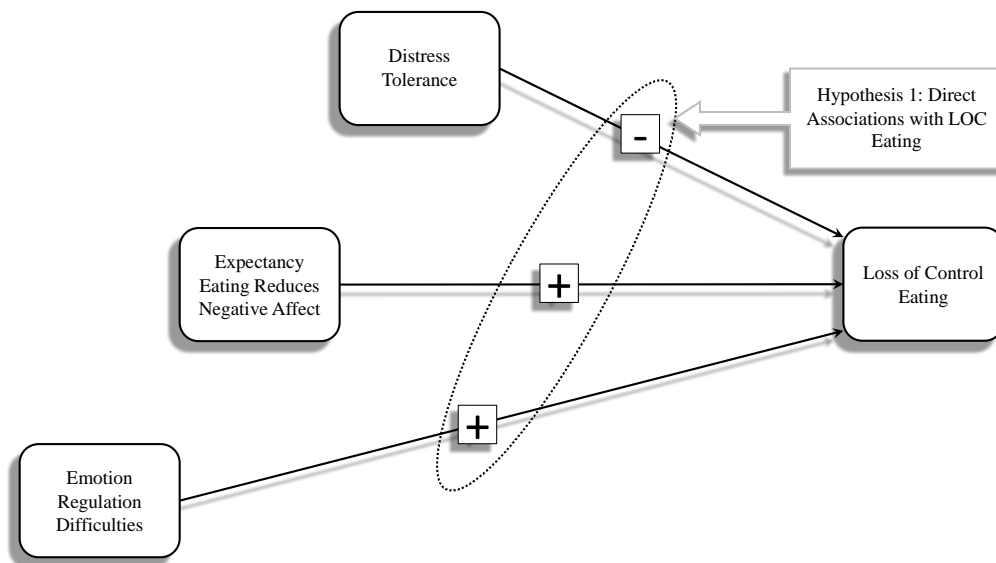


Figure 1: Hypothesis 1

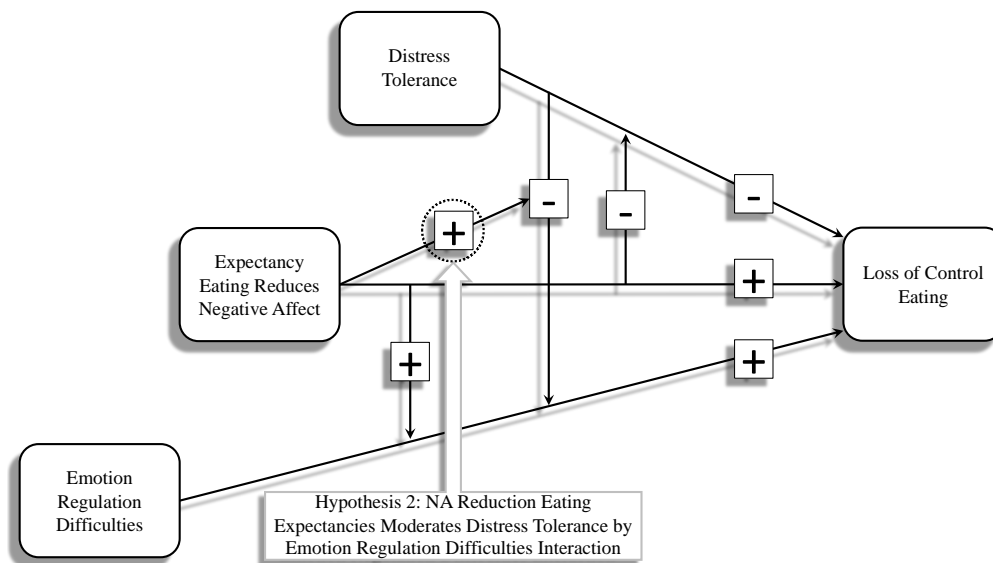


Figure 2: Hypothesis 2

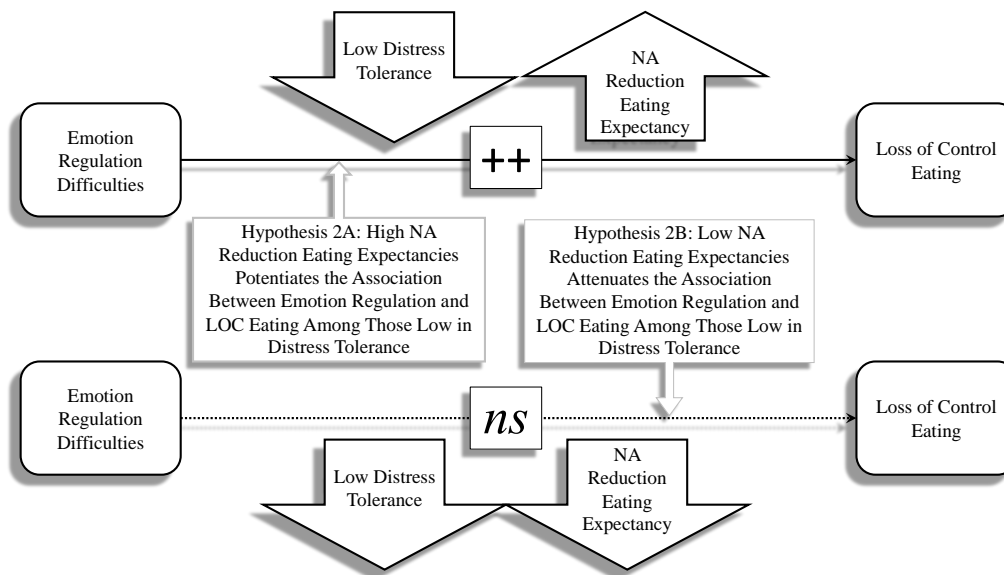


Figure 3: Hypothesis 2A and 2B

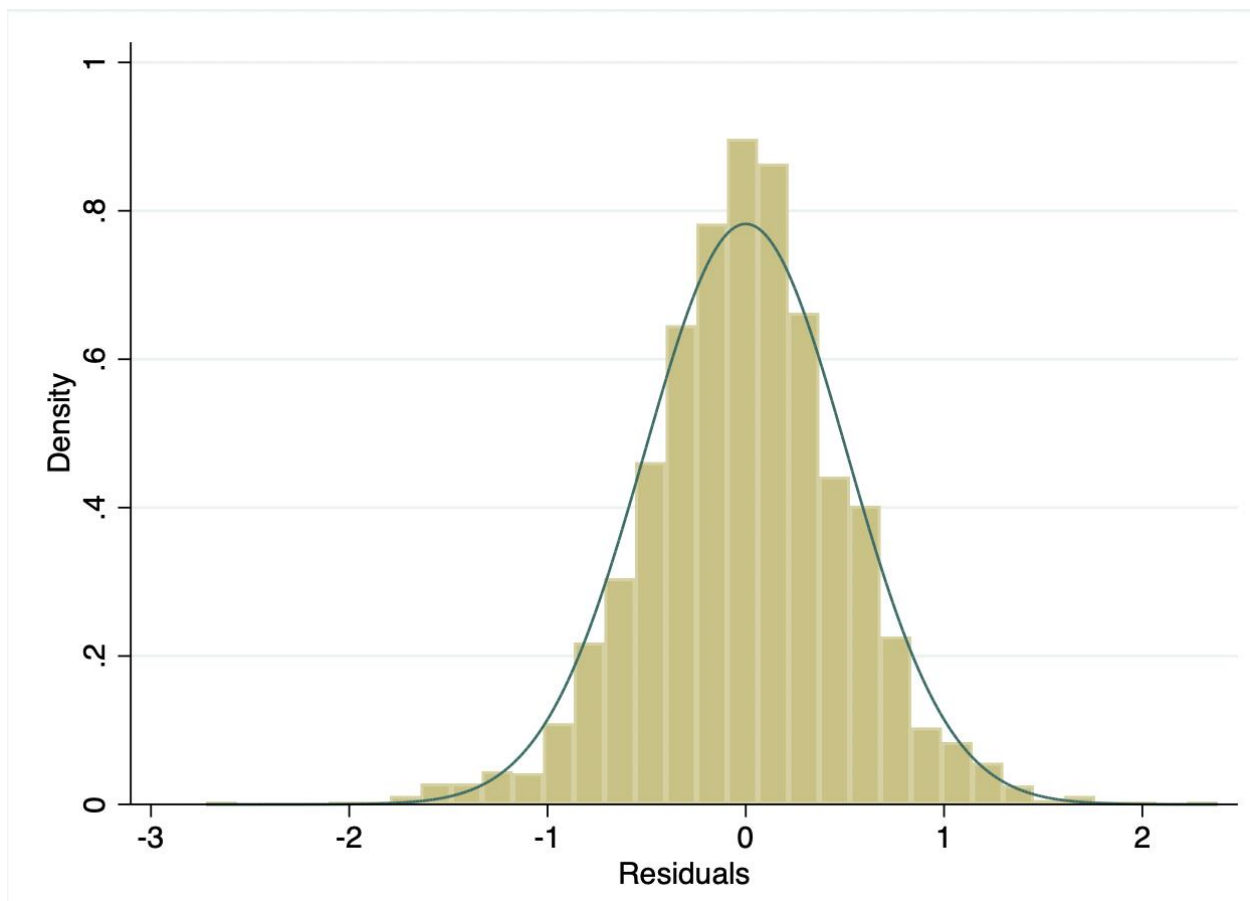


Figure 4: Distribution of Residuals of LOCES on Predictors

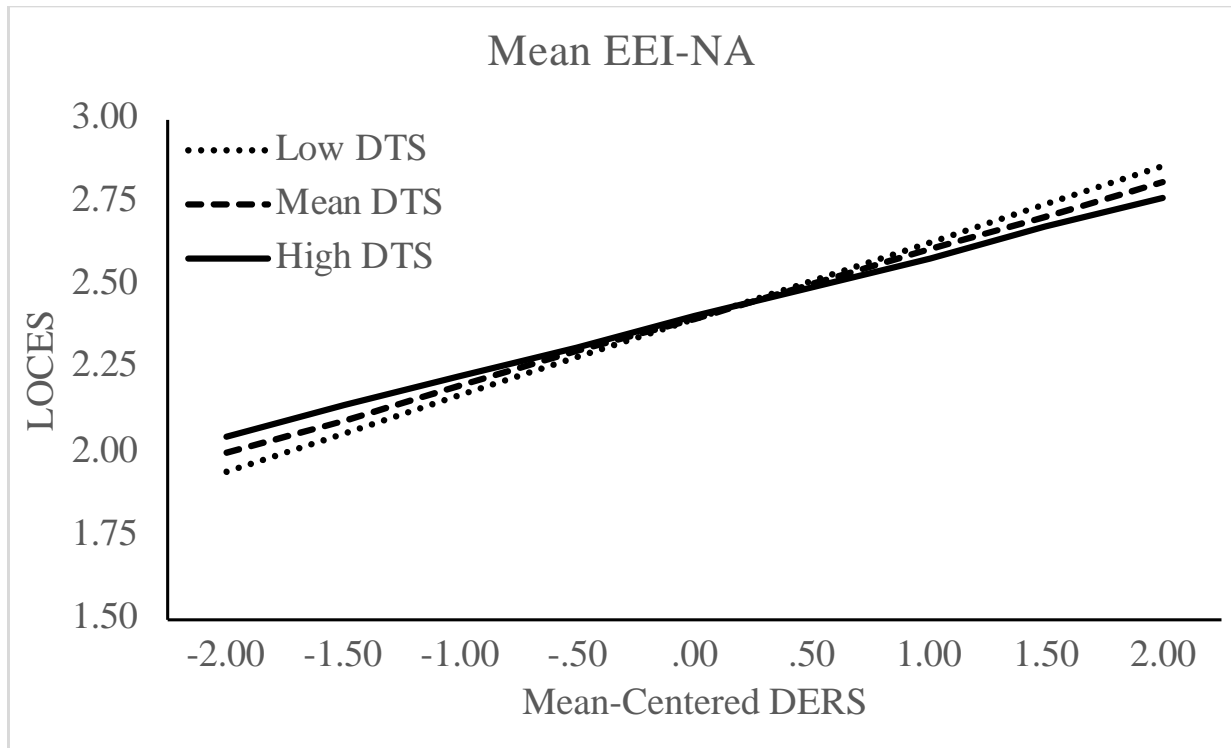


Figure 5: Distress Tolerance Moderating the Relationship between Emotion Regulation Difficulties and LOCE at Mean NA Reduction Expectancy

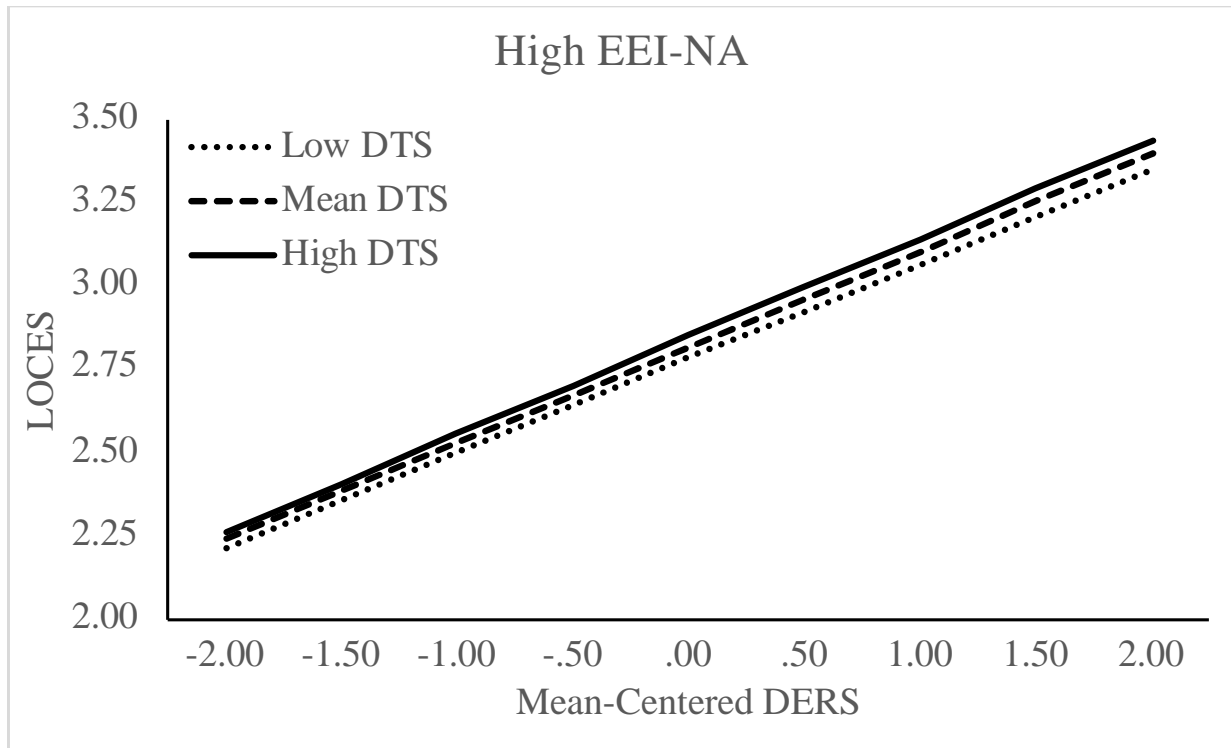


Figure 6: Distress Tolerance Moderating the Relationship between Emotion Regulation Difficulties and LOCE at High NA Reduction Expectancy

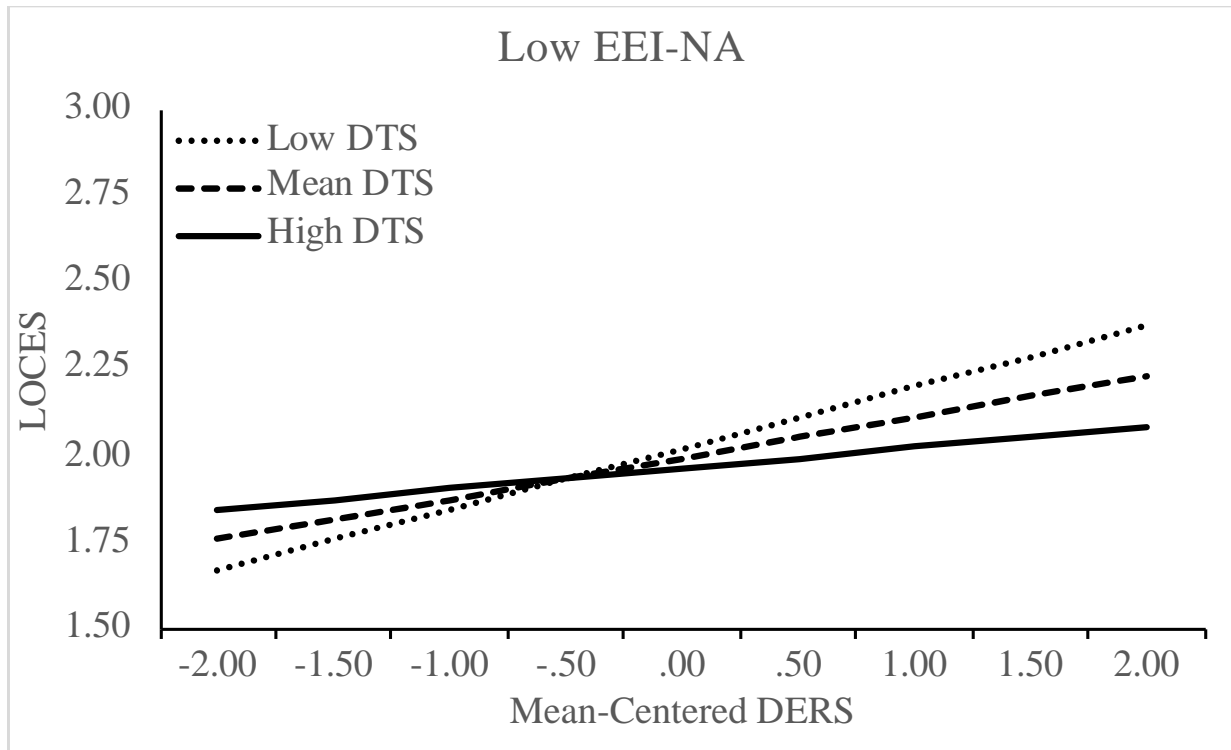


Figure 7: Distress Tolerance Moderating the Relationship between Emotion Regulation Difficulties and LOCE at Low NA Reduction Expectancy

APPENDIX B: MEASURES

Depression, Anxiety, and Stress Scale 21-Item Version (DASS-21)

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

	Did not apply to me at all (0)	Applied to me to some degree, or some of the time (1)	Applied to me to a considerable degree or a good part of time (2)	Applied to me very much or most of the time (3)	Prefer not to respond
I found it hard to wind down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware of dryness of my mouth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I couldn't seem to experience any positive feeling at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found it difficult to work up the initiative to do things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tended to over-react to situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experienced trembling (e.g. in the hands)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I felt that I was
using a lot of
nervous energy

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I was worried
about
situations in
which I might
panic and
make a fool of
myself

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I felt that I had
nothing to look
forward to

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I found myself
getting
agitated

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I found it
difficult to
relax

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I felt down-
hearted and
blue

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I was
intolerant of
anything that
kept me from
getting on with
what I was
doing

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I felt I was
close to panic

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I was unable to
become
enthusiastic
about anything

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I felt I wasn't
worth much as
a person

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I felt that I was
rather touchy

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I was aware of
the action of
my heart in the
absence of
physical
exertion (e.g.
sense of heart
rate increase,
heart missing a
beat)

☐☐☐☐☐

I felt scared
without any
good reason

☐☐☐☐☐

I felt that life
was
meaningless

☐☐☐☐☐

Eating Disorder Examination Questionnaire (EDEQ)

The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully. Please select the appropriate number of days on the right. Remember that the questions only refer to the past four weeks (28 days) only. On how many of the past 28 days...

	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day	Prefer not to respond
Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you tried to exclude from your diet any	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

foods that
you like in
order to
influence
your shape
or weight
(whether or
not you have
succeeded)?

Have you
tried to
follow
definite rules
regarding
your eating
(for
example, a
calorie limit)
in order to
influence
your shape
or weight
(whether or
not you have
succeeded)?

Have you
had a
definite
desire to
have an
empty
stomach with
the aim of
influencing
your shape
or weight?

Have you
had a
definite
desire to
have a
totally flat
stomach?

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in (for example, working following a conversation, or reading)?

☐☐☐☐☐☐☐☐

Has thinking about shape or weight made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?

☐☐☐☐☐☐☐☐

Have you had a definite fear of losing control over eating?

☐☐☐☐☐☐☐☐

Have you had a definite fear that you might gain weight?

☐☐☐☐☐☐☐☐

Have you
felt fat?

☐☐☐☐☐☐☐☐

Have you
had a strong
desire to lose
weight?

☐☐☐☐☐☐☐☐

Over the past 28 days, on how many DAYS have you eaten what other people would regard as an unusually large amount of food (given the circumstances)?

▼ 0 ... Prefer not to respond

On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)?

▼ 0 ... Prefer not to respond

Over the past 28 days, how many times have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food and have had a sense of loss of control at the time)?

▼ 0 ... Prefer not to respond

16. Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight?

▼ 0 ... Prefer not to respond

17. Over the past 28 days, how many times have you taken laxatives as a means of controlling your shape or weight?

▼ 0 ... Prefer not to respond

18. Over the past 28 days, how many times have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape, or amount of fat, or to burn off calories?

▼ 0 ... Prefer not to respond

Over the past 28 days, on how many days have you eaten in secret (i.e. furtively)? Do not count episodes of binge eating.

- ☐ No days
- ☐ 1-5 days
- ☐ 6-12 days
- ☐ 13-15 days
- ☐ 16-22 days
- ☐ 23-27 days
- ☐ Every day
- ☐ Prefer not to respond

On what proportion of the times that you have eaten have you felt guilty (felt that you've done wrong) because of its effects on your shape or weight? Do not count episodes of binge eating.

- ☐ None of the time
- ☐ A few times
- ☐ Less than half
- ☐ Half of the time
- ☐ More than half
- ☐ Most of the time
- ☐ Every time
- ☐ Prefer not to respond

Please choose the appropriate answer. Over the past 28 days...

	(0) Not at all	(1)	(2) slightly	3	(4) Moderately	(5)	(6) Markedly	Prefer not to respond
...how concerned have you been about other people seeing you eat? Do not count episodes of binge eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has your weight influenced how you think about (judge) yourself as a person?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... has your shape influenced how you think about (judge) yourself as a person?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... how much would it have upset you if you had been asked to weigh yourself once a week (no more, or less often) for the next four weeks?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... how dissatisfied have you been with your weight?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

...how
dissatisfied
have you been
with your
shape?

☐☐☐☐☐☐☐☐

...how
uncomfortable
have you felt
seeing your
body (for
example,
seeing your
shape in the
mirror, in a
shop window
reflection,
while
undressing, or
taking a bath
or shower)?

☐☐☐☐☐☐☐☐

...how
uncomfortable
have you felt
about others
seeing your
shape or
figure (for
example, in
communal
changing
rooms, when
swimming, or
wearing tight
clothes)?

☐☐☐☐☐☐☐☐

Difficulties in Emotion Regulation Scale (DERS)

Please indicate how often these items apply to you using the following scale:

	Almost never (0-10%)	Sometimes (11-35%)	About half the time (35-65%)	Most of the time (66-90%)	Almost always (91-100%)	Prefer not to respond
I am clear about my feelings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I pay attention to how I feel.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experience my emotions as overwhelming and out of control.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no idea how I am feeling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have difficulty making sense out of my feelings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am attentive to my feelings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know exactly how I am feeling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I care about what I am feeling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confused about how I feel.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I acknowledge my emotions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I become angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

with myself for
feeling that way.

When I'm upset, I
become
embarrassed for
feeling that way.

When I'm upset, I
have difficulty
getting work
done.

When I'm upset, I
become out of
control.

When I'm upset, I
believe that I will
remain that way
for a long time.

When I'm upset, I
believe that I'll
end up feeling
very depressed.

When I'm upset, I
believe that my
feelings are valid
and important.

When I'm upset, I
have difficulty
focusing on other
things.

When I'm upset, I
feel out of
control.

When I'm upset, I
can still get
things done.

When I'm upset, I
feel ashamed
with myself for
feeling that way.

☐☐

When I'm upset, I know that I can find a way to eventually feel better.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I feel like I am weak.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I feel like I can remain in control of my behaviors.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I feel guilty for feeling that way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I have difficulty concentrating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I have difficulty controlling my behaviors.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I believe that there is nothing I can do to make myself feel better.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I become irritated with myself for feeling that way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I start to feel very bad about myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I'm upset, I believe that wallowing in it is all I can do.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I'm upset, I
lose control over
my behaviors.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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When I'm upset, I
have difficulty
thinking about
anything else.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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When I'm upset, I
take time to
figure out what
I'm really feeling.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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When I'm upset,
it takes me a long
time to feel
better.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

When I'm upset,
my emotions feel
overwhelming.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Distress Tolerance Scale (DTS)

Think of times that you feel distressed or upset. Select the item from the menu that best describes your beliefs about feeling distressed or upset.

	Strongly disagree (5)	Mildly disagree (4)	Agree and disagree equally (3)	Mildly agree (2)	Strongly agree (1)	Prefer not to respond
Feeling distressed or upset is unbearable to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I feel distressed or upset, all I can think about is how bad I feel.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can't handle feeling distressed or upset.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My feelings of distress are so intense that they completely take over.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There's nothing worse than feeling distressed or upset.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can tolerate being distressed or upset as well as most people.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

My feelings
of distress or
being upset
are not
acceptable.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I'll do
anything to
avoid feeling
distressed or
upset.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Other people
seem to be
able to
tolerate
feeling
distressed or
upset better
than I can.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Being
distressed or
upset is
always a
major ordeal
for me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I am
ashamed of
myself when
I feel
distressed or
upset.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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My feelings
of distress or
being upset
scare me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I'll do
anything to
stop feeling
distressed or
upset.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

When I feel
distressed or
upset, I
cannot help

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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but
concentrate
on how bad
the distress
actually
feels.

Eating Expectancy Inventory (EEI)

Note: Expectancy eating alleviates negative affect subscale items are bolded.

Read each statement and select the number of the response which most closely matches your level of agreement. Please respond to the items in terms of what they word "eating" means to you.

	(1) Completely disagree	(2) Mostly disagree	(3) Slightly disagree	(4) Neither agree nor disagree	(5) Slightly agree	(6) Mostly agree	(7) Completely agree	Prefer not to respond
Eating makes me feel loved.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am feeling depressed or upset, eating can help me take my mind off my problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating makes me feel out of control.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating fills some emotional need.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am feeling anxious or tense, eating helps me relax.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't see eating as a pleasurable event.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating helps me deal with feelings of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**inadequacy
about myself.**

Eating doesn't
help me deal
with boredom.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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When I have
nothing to do,
eating helps
relieve the
boredom.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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When I eat, I
often feel I am
not in charge
of my life.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**When I am
feeling
anxious,
eating does
not make me
feel calmer.
(r)**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Eating serves
as an
emotional
release.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Eating seems
to decrease
my level of
anxiety if I am
feeling tense
or stressed.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating is a
good way to
celebrate.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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When I do
something
good, eating is
a way to
reward myself.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating isn't
useful as a
reward for me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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I don't get a sense of security or safety from eating. (r)

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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If I have nothing planned to do during the day, eating isn't something that would help me fill the time.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating helps me think and study better.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating is fun and enjoyable.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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My eating behavior often results in a feeling that I am not in control.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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When I work hard or accomplish something, eating doesn't serve as a good reward.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating is something to do when you feel bored.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating is a way to vent my anger.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating helps me avoid uncomfortable

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**social
situations.**

**When I am
angry at my
parents,
spouse, or
friends, eating
helps me get
back at them.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**When I am
faced with
difficult tasks,
eating can
help me avoid
doing them.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Eating helps
me forget or
block out
negative
feelings, like
depression,
loneliness, or
fear.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Eating calms
me when I am
feeling
stressed,
anxious, or
tense.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Eating can
help me bury
my emotions
when I don't
want to feel
them.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Eating helps
me work
better.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Eating helps
me cope with
negative
emotions.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Eating does not
make me feel
out of control.

**Eating helps
me deal with
sadness or
emotional
pain.**

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Loss of Control over Eating Scale (LOCES)

In the last 4 weeks (28 days), how often have you had the following experiences during a time when you were eating?

Please respond to each item using the following scale:

	(1) Never	(2) Rarely	(3) Occasionally	(4) Often	(5) Always	Prefer not to respond
I felt I had lost control over eating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I continued to eat past the point where I wanted to stop.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I ate until I was uncomfortably full.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I kept eating even though I was no longer hungry.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt like I had "blown it" and might as well keep eating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found myself eating despite negative consequences.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt helpless about controlling my eating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While eating, I had feelings of shame.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

While eating, I felt I was stuffing myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While eating, I felt disgusted.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While eating, I felt a sense of relief or release.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While eating, I felt a physical rush or high.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While eating, I felt like I was watching or looking at myself from "outside".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt like the craving to eat overpowered me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My eating felt like a ball rolling down a hill that just kept going and going.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I lost track of what and how much I was eating,	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While eating, I felt like I was not paying attention to what I was eating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

While eating,
I felt like I
was in my
own little
world.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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I could not
concentrate on
anything other
than eating.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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I felt like I
could not do
anything other
than eat.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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I finished
eating only to
discover I had
eaten more
than I thought.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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I felt I was
eating faster
than normal.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

Eating as
quickly as
possible
seemed to be
the only thing
that mattered.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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While eating,
it did not
seem real.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Demographic Variables

1. How old are you?

2. What is your biological sex?

☐ Male

☐ Female

3. Please enter your height (in feet and inches) and weight (in pounds).

☐ Height (feet) _____

☐ Height (inches) _____

☐ Weight (lbs) _____

APPENDIX C: DATA COLLECTION STANDARD OPERATING PROCEDURE (SOP)

Below are instructions for designing sets of surveys in Qualtrics in order to keep personally identifiable information separate from research related information. This is especially important in instances in which research participants are reporting on illegal behavior and/or behavior of a sensitive nature. There are two scenarios below. In the first, we assume that you are collecting data in which there is some sort of screen to identify if individuals qualify for a second/follow-up study/survey. This scenario allows the researcher to link PII (contact information) to participants and build a database of contacts for use in scenario 2. In the second scenario, we are assuming that the researcher has identified a sample of participants to participate in a new study (or new study phase). Scenario 2 allows you to develop contacts so that you can email participants their own unique participation link. This link will have the participants unique ID embedded in it, which can be used to link back to data from scenario 1 and precludes the need for PII in further studies.

Scenario 1

In scenario 1, you are creating a survey with personally identifiable information. There is the assumption that for one reason or another, you may need to follow-up with the participant (e.g., they meet eligibility criteria for a second study, they are being tracked longitudinally, etc.). For this type of study, you will need two surveys. First, you will need the research survey which contains all of the pertinent information to the study, including sensitive/illegal information (if these are part of your study). Next, you will need a PII survey. This survey will only contain PII, and should be limited to the absolute necessity (preferably just email). We start below by creating the Research Survey:

1. Create your research survey which has **NO** PII (i.e., no names, emails, etc.).
2. After the survey is created, you will need to identify embedded data in order to link to the PII survey.
 - a. Start by going to Survey Flow
 - b. Under Survey Flow, select “+ Add a New Element Here”
 - c. Select “Embedded Data”
 - d. Type ID in the dropdown menu
 - e. Leave the description as “Value will be set from panel or URL”
 - f. Select “Move” and then move the Embedded Data field above any survey items (see below)

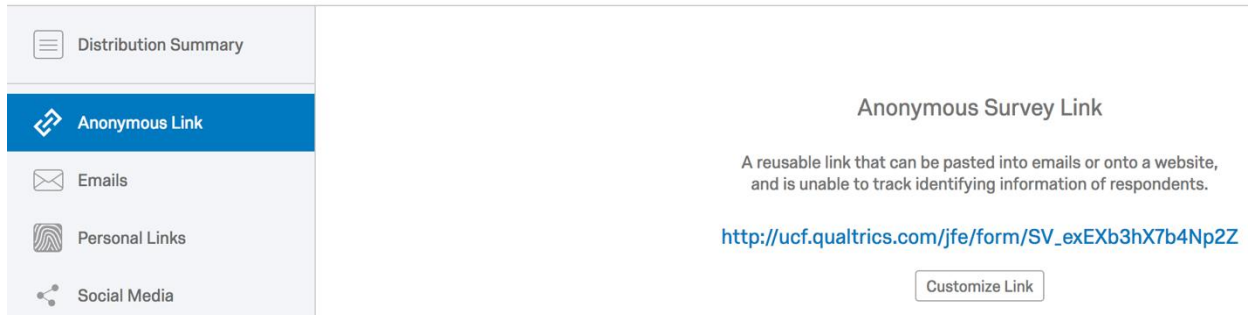
Survey Flow Test Project for IRB - Screen 2

The screenshot shows the 'Survey Flow' interface for a 'Test Project for IRB - Screen 2'. On the left, a vertical arrow indicates the flow sequence. The main area displays three blocks in a list:

- Set Embedded Data:** This block is highlighted with a green background. It contains a dropdown menu set to 'ID' with the description 'Value will be set from Panel or URL.' and a link 'Set a Value Now'. Below this is a link 'Add a New Field'. At the bottom right of this block are action links: 'Add Below', 'Move', 'Duplicate', 'Add From Contacts', 'Options', and 'Delete'.
- Show Block: Test1 (2 Questions)** This block has a light gray background and action links: 'Add Below', 'Move', 'Duplicate', and 'Delete'.
- Show Block: Block 1 (1 Question)** This block also has a light gray background and action links: 'Add Below', 'Move', 'Duplicate', and 'Delete'.

At the bottom left, there is a green plus icon followed by the text '+ Add a New Element Here'.

3. This survey is now set to receive IDs from the PII survey. Before moving on, go to “Distributions” then “Anonymous Link”, and copy the link for this survey.



4. Next, we will be using the PII survey. This survey should contain the participants contact info as needed (typically email)
5. In the PII survey, Click the Survey Flow button at the top of the survey.
6. Add a new element, and choose Embedded Data as the type. Call this field ID as you did before, but this time, click Set a Value Now, and set it equal to `${e://Field/ResponseID}` (you can just copy and paste that value into the text box). This ResponseID refers to a randomly generated unique value that Qualtrics already creates every time someone fills out your survey. When you're done, it will look like this:



7. As previously, click the Move link inside the element box, and drag this Embedded Data flow element above (but on the same hierarchical level) as the Default Question Block. We do this so that every survey participant is assigned an ID before answering the questions. After you move it, the two blocks will look like this:




8. Go to the Survey Options, under the Edit Survey tab, in the Survey Termination section, select Redirect to a URL.
9. Paste the anonymous survey link for the other survey (Research Survey) - the link you copied at the end of the last section of instructions - into the text field provided. At the end of this link add the following text: ?ID=\${e://Field/ID}
(Note: if there is already a question mark in the address, use a & instead of the ?)

Survey Termination

☐ Default end of survey message.

☐ Custom end of survey message...

 ☐ Redirect to single response report.

☒ Redirect to a full URL, ex. "http://www.qualtrics.com":

****You now have two datasets. One with PIII & ID columns, and one with Data & ID columns****

Scenario 2

In scenario 2, you start with an Excel spreadsheet with participant info and pre-assigned participant IDs. These can be IDs you have generated, or IDs that were generated in scenario 1 (note, that if you want to link this data to data from scenario 1, you will need use the same ID from scenario 1). In Qualtrics, Panels allow you to send out surveys to specific people using their e-mail. In order to still keep data anonymous you need to somehow be able to have an ID# in data and not their personal information. When they click on the link in their email the following instructions will allow you to add variables in your data to track who is who anonymously- especially if you send them multiple surveys

First: Create Your Participant Spreadsheet

1. Use the format below to create your panel. It needs to be saved as a .csv - you can create it in Excel. The first four headings have to be exactly the same as the example: FirstName, LastName, Email, ExternalDataReference. The rest of the headings can be whatever variables you want embedded in your data set. One of these should contain the same participant ID as is in the ExternalDataReference column. In this example, we called that column "ID" - you can call it something different as long as you use that name consistently when following other parts of these instructions which refer to ID.

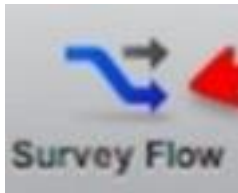
You can include the name and email address as they will be stripped out of the results as long as you use the recommended column names (FirstName, LastName, Email, ExternalDataReference). Including the name in the panel allows you to personalize the email you will be sending out for surveys. By following the rest of these instructions,

Qualtrics will omit any information in the first four columns, leaving only the ID (and whatever other additional columns you add) in the dataset at the end of the survey.


	A	B	C	D	E	F
1	FirstName	LastName	Email	ExternalDataReference	ID	Sex
2	Lionel	Obrien	fake@gmail.com	ID001	ID001	m
3	Clark	Nichols	fake2@gmail.com	ID002	ID002	m
4	Lillie	Tyler	fake3@gmail.com	ID003	ID003	f
5	Ervin	Dunn	fake4@gmail.com	ID004	ID004	m
6	Ramona	Richards	fake5@gmail.com	ID005	ID005	f
7	Katrina	Roy	fake6@gmail.com	ID006	ID006	f
8						

Second: Create the Survey

1. Create the longitudinal or followup survey.
2. Create a new panel, choose to import from a file, and upload your .csv file. If you've never created a panel before, Qualtrics has instructions [here](#). When you upload the .csv file into the panel, the column with the heading "ID" (and any additional columns you added to its right) should be in blue, the rest should be black.
3. Now, you will add Embedded Data to the survey so the ID, as well as any additional columns you added to its right, will be included in your data set. Click the Survey Flow button.



4. Click Add New Embedded Data Field
5. Create embedded data elements for each of your custom column headers. The naming needs to be exactly the same. In this case, I have ID and Sex.


Set Embedded Data:

ID

Value will be set from Panel or URL. [Set a Value Now](#)

Sex

Value will be set from Panel or URL. [Set a Value Now](#)

6. Move this element to the top of the survey flow by clicking Move and dragging it up. It should look something like this when you're done:

The screenshot shows the Qualtrics survey editor interface. On the left, a vertical sidebar contains a 'Move' button (represented by a right-pointing arrow). The main area displays a survey flow. The top block is titled 'Set Embedded Data:' and contains two fields: 'ID' and 'Sex'. Both fields have a value of 'Value will be set from Panel or URL.' and a link 'Set a Value Now'. Below these fields is a link 'Add a New Field'. The bottom block is titled 'Show Block: Default Question Block (0 Questions)' and contains a cube icon.

7. Important: At the top of the survey, click Survey Options and then check the Anonymize Responses checkbox, and Save Changes.

The screenshot shows the 'Survey Termination' section of the Qualtrics survey editor. On the left, there is a 'Thank You' message placeholder. On the right, there are several options for survey termination, each with a radio button or checkbox. The options are: 'Default end of survey message.' (selected), 'Custom end of survey message...', 'Redirect to single response report.', 'Redirect to a URL full URL, ex. "http://www.qualtrics.com":', 'Send additional thank you email from a library... When distribu...', and 'Anonymize Response. Do NOT record any personal information'. The 'Anonymize Response' option is checked and circled in red.

8. Now your survey is set up. To send emails, follow instructions for [Using the Qualtrics Mailer](#), indicating your panel in the To field. After the initial distribution, you can track how many participants have responded and use the [Send Reminder or Thank You](#) feature to follow up with participants.

Third: View Responses

When you [download your data](#), it will not include the values in the first four columns of your panel. However, it will include the ID so that you could, for example, identify participants who should take a second survey based on their responses to the first, or compensate participants for their effort, using the contact information in your original .csv. To maintain confidentiality, take precautions if you download and store your survey responses and panel .csv; for example, you

might password protect these files, password protect your computer, and/or obscure the file names so the relationship is not obvious to someone who might unexpectedly access your files.

Data Safety/Security Procedures

UCF uses the Qualtrics platform as our primary source for survey data collection. The statement on data security for data housed by Qualtrics can be found here:

<https://www.qualtrics.com/security-statement/>

Regarding data security, Qualtrics states: “Qualtrics is FedRamp Authorized. FedRAMP is the gold standard of U.S. government security compliance, with over 300 controls based on the highly-regarded NIST 800-53 that requires constant monitoring and periodic independent assessments. More information is found at <https://www.fedramp.gov>. Qualtrics meets the general requirements set forth by many U.S. Federal requirements, including the FISMA Act of 2002. We meet or exceed the minimum requirements as outlined in FIPS Publication 200.”

Thus, data housed by Qualtrics servers is one of the most secure locations available. This is why Qualtrics is the most widely contracted platform by Universities in the US. However, once downloaded from the Qualtrics site, data is no longer encrypted. This data, if stored on a University server, is subject to potential data breach. The following procedures are followed in the REALE-TIME Lab as a way to mitigate potential data breach of PII.

1. Data from research surveys (noted in the SOP above) do not contain PII. The storage of this data is less sensitive, and thus can be stored on the lab server. Once research data (non-PII data) has been downloaded to a lab computer, it is transferred to the lab data server. This is an offline server (i.e., basic computer without an internet connection). All data is stored in a password protected file. All data files from a given project are stored in a single password protected project folder for that project.
2. It is necessary to examine data that contains PII if (a) it is necessary to contact individuals that qualify for a study, based on their research survey data (scenario 1 above) or (b) it is necessary to link data from multiple surveys (e.g., for example, if people need to be compensated based on the number of surveys completed; scenario 2). In these instances, individual random IDs will be identified in advance. These IDs will be used to form a new temporary data file. This data file will then be used to match random IDs to the PII data file (which contains both PII, such as email/phone/name, as well as the random ID for that participant). Using this approach, contact info will be extracted and used for the selected purpose (e.g., contacting for follow-up participation and/or payment).
3. **IMPORTANT NOTE:** Using the above approach eliminates the need to EVER include PII in a data base with actual research data. At no time will PII be combined with research data in a single data file. Further, all matching of PII to random IDs from research data will take place on the offline lab server. All PII data sets will be deleted from the offline server (i.e., they will not be stored in the lab). PII data will be deleted from the secure Qualtrics server after (a) the end of each semester in scenario 1 (since accept/declines cannot be done by individuals) or (b) at the conclusion of the study in scenario 2 (since there are times in which

participation will need to be tracked beyond the semester in order to compensate for longitudinal studies. All PII data sets will be deleted at the completion of data collection, regardless of whether or not analysis is on-going. With the inclusion of random IDs in all research data, there should be no reason to maintain PII data if (a) the study is no longer looking for qualifying or participants or (b) the qualifying participants have fully participated and been compensated (i.e., all participants are done providing data).

APPENDIX D: IRB APPROVAL NOTICE



UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138, IRB00012110
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

APPROVAL

August 13, 2020

Dear Emily Burr:

On 8/13/2020, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	Mood and Eating Behavior during the COVID-19 Epidemic: An Investigation in Two Parts
Investigator:	Emily Burr
IRB ID:	STUDY00002016
Funding:	None
Grant ID:	None
IND, IDE, or HDE:	None
Documents Reviewed:	<ul style="list-style-type: none">• HRP-251- LOCE_Signed.pdf, Category: Faculty Research Approval;• COVID 19 LOCE Invitation email to Phase 2.docx, Category: Recruitment Materials;• End of Study Email.docx, Category: Other;• Evening Survey_UPDATE.docx, Category: Survey / Questionnaire;• Morning Survey_UPDATE.docx, Category: Survey / Questionnaire;• Online Ad, Category: Recruitment Materials;• Phase 1 Consent, Category: Consent Form;• Phase 1 Survey_UPDATE.docx, Category: Survey / Questionnaire;• Phase 2 Consent, Category: Consent Form;• Phase 2 Evening Survey Reminder.docx, Category: Other;• Phase 2Morning Survey Reminder.docx, Category: Other;• PII, Category: Other;• Protocol, Category: IRB Protocol;• Standard Operating Procedures for Studies with Personally Identifiable Information.docx, Category: Other;

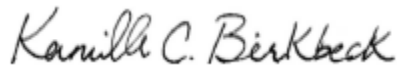
The IRB approved the protocol 8/13/2020.

In conducting this protocol, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. Guidance on submitting Modifications and a Continuing Review or Administrative Check-in are detailed in the manual. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

Due to current COVID-19 restrictions, in-person research is not permitted to begin unless you are able to follow the COVID-19 Human Subject Research (HSR) Standard Safety Plan with permission from your Dean of Research or submitted your Study-Specific Safety Plan and received IRB and EH&S approval. Be sure to monitor correspondence from the Office of Research, as they will communicate when restrictions are lifted, and all in-person research can resume.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

A handwritten signature in black ink that reads "Kamille C. Birkbeck". The script is cursive and fluid.

Kamille Birkbeck
Designated Reviewer

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